1878phae.proj..471O

KG
136F
470

RD

R 28 KG 11365.470

KG 11365.470

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1
2
3 Index
4
5
6
7
8
9
10
1
2
3 Deimos Ephem.
4 Satr. Hyper.
5 Mim. Encel
6
7 Neptune Sats
8 (123)
9 〃
20 〃
1 Propos. Catalogues. Br. Ft. Stars
2
3 Stars near. lat. Mars
4 Algol
5 S Cancri
6 ε Lyrae α Lyrae Stars near
7 Stars Min. Comp
8 A Bright Stars with Minute Comp
9 〃 〃
30 〃 〃

31 A Bright stars with minute companions
2 "
3 "
4 "
5 "
6 "
7 "
8 "
9 "
40 "
1 "
2 B Bright stars with
3
4
5
6
7
8
9
50
1
2
3
4
5
6
7
8 C Strange Stars.
9 " "
60 " "

61 C. Struve Stars
2 " "
3 " "
4 " "
5 "
6 "
7 "
8 "
9 "
70 "
1 "
2 "
3 "
4 "
5 "
6 "
7 "
8 Stars to be repeated
9 "
80 Investigation repeated
1 "
2 "
3
4 Wide Double Stars – Burnham.
5 "
6 "
7 "
8 Bright Variables
9 " Doubles
90 Minimas

91
2
3 Summary of details of A, B, C, D
4 References
5
6 New Stars
7
8 Addit. Stars from Webb
9 Sat. Uranus Obsern. checks
100
1
2 I. Additions to C.
3 "   "
4 "   "
5 "   "
6 Sat. Uranus
7 "   "
8 Constant Checks
9 Stars for Photo H & I
110
1
2 Stars remaining from C from 15h 29m to 18
3 "
4 "
5 "
6 "   " & March after 18h.
7 "   "
8
9
120 Faint Stars remaining Jan 1878

121 Faint Stars remaining Jan 1878
2 " "
3 " "
4 Eclipses Jupiter's Satel.
5
6 Shadows " "
7
8 β Lyrae
9
130 Algol. β Persei
1
2. Test Phot. H
3 " " "
4 " " "
5
6 " " H
7
8 " " I
9
140 W. Equatorial
1
2 Eclipses Jupiter's Satellites Sept. Oct. Nov.
3
4 Satellite Neptune
5 Mimas, Iapetus
6 Phot H., E. Equatorial
7
8
9
150

Outer Satellite of Mars.

	Time						
Oct	27	21.0	E	Oct	28	12.1	W.
"	29	3.3		Oct	29	18.4	
"	30	9.5		"	30	0.6	
"	31	15.7					

Hyperion. 14. diam

Oct.	4	W		15	E
	26		Nov.	6	
Nov.	17		"	28	

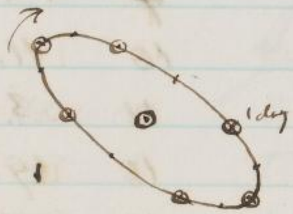
Iapetus. 32.15 diam

Oct.	16d	10	S
Nov.	5	6	I.
"	25	2	N
Dec.	14	22	W
Jan.	3	18	S

Mimas			Enceladus	
	Elongation Marth	Hall 16 cm		
Nov 1st.	11.8 E.	10.2 E.	Nov. 1st.	13.2 E.
2d		8.8 "	2d	5.7 W
3d		7.4 "	3	14.5 W
4th		6.0 "	4	7.0 E.
5		4.7 "	5	15.9 E.
6		14.6 W	6	8.3 W
7		13.2 "	7	17.2 W
8		11.8 "	8	9.6 E.
9		10.5 "	9	2.1 W
10		9.1 "	9	18.5 E.
11		7.7 "	10	11.0 W
12		6.3 "	11	3.4 E.
13		4.9 "	11	19.8 W
Nov. 18		9.3 E.	12	12.3 E.
19		8.0 "	19	8.7 E.
20		6.6 "		
24		12.4 W		
25		11.0 "	25	12.7 W
26		9.6 "		
27		8.3 "	27	14.1 E.
28		6.9 "		

d

Nov. 1st	1	
Dec 1st	31	
Jan 1st	62	
Feb 1st	93	94



Satellite of Neptune

Nature. 441

8.3h C.M.T.

1 rev. = 5.8769d 8 rev = 47.015dy

	Ang.	Dist.
Oct 28		
29		
30		
31		
Nov 1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
1		
2		
3		
4		
5		
6	30°	15."2
7	314	5.7
8	231	14.9
9	209	14.7
20	122	5.7
1	49	15.4
2	27	14.2
3	291	5.9
4	228	15.8
5	25	13.6

Elongations 17"

		Oct. 2	21	220°
		8	18	"
		14	15	"
		20	12	"
		26	9	"
30d		29	7.5	40°
Feb 2.	7 Nov.	1	6	220
5	5	4	4.5	
8	4	7	3	220
11	2	10	1.5	
14	1	13	0	220
16	23	15	22.5	
19	22	18	21	220
22		21	19.5	
25		24	18	220
~~Feb~~ 28 Feb		27		
3		30	15	
6				
9			12	
12				
15			9	
18				
21			6	

D.M. Stars near path of (123) Brunhild
Oct. 28 – Nov. 10

D.M. No.	Mag.	RA 1878			Dec. 1878	
219	9.3	1h	30m	57s	21°	12'
220	8.0			58		56
1	8.0		31	17	22	5
2	7.0			20	21	16
3	9.3			34		20
4	7.4		32	14		18
5	9.5			51		32
6	9.1		33	44		52
7	9.4			59	22	1
8	9.5		34	3	21	40
9	9.5			5		30
230	8.8			31		51
1	9.5		35	33	22	4
2	9.5		36	37	21	41
3	9.5		37	49	22	1
4	8.8		39	27	21	52
5	9.5			28		14
6	9.1			48		14
7	9.4		40	21		22
8	9.5			36		33
9	9.5		41	1		51
240	9.0			18		12
1	9.3			45		33
2	8.1			53		47
243	6.0		43	25	21	40

Ephemeris of (123)

Oct. 27	1h	44m	40s	+22°	22'
31		40	56	22	3
Nov 4		37	20	21	42
8		33	56	21	20
12		30	48	20	57

Bright Stars

α Arietis	2	0	20	22	54
7m	1	54	48	22	48
5	1	51	10	23	0
8	1	50	3	22	27
6	1	43	25	21	40

1	27	34	20	33
1	28	40	20	22
1	29	14	27	4

Corrected Ephemeris of (123)

	h	m	s	°	′	Correction from obs. s	′
Oct. 31	1	39	40	+21	56		
Nov. 1		38	45		51		
2		37	51		46		
3		36	57		41		
4		36	4		35	+10.	−2
5		35	12		30		
6		34	20		24	+20	−3
7		33	29		19	+24	−3
8		32	40		13		
9		31	52		8	+31	−4
10		31	5		2		
11		30	18	20	56		
12		29	32		50		
13		28	46	20	44		
14		28	1	20	38	+53	−3

Nov. 14 Approx place α 1 28 46 20 32

Nov. 15 1 28 15 20 29

Stars

	DM. No.	Mag.	Rt h	m	s	°	′
21°	220	7.0	1	31	27	+21	16
	224	7.4		32	14	21	18
20°	251	8.4	1	29	14	21	4
	247	8.5	1	28	40	20	22
	241	8.7	1	27	35	20	33
	240 ~~236~~	9.0	1	26	47	20	33
	237	9.3	1	26	10	20	25
	236	9.0	1	24	52	20	45

} 342 cR 33

Brunhild

Nov. 20

Computed Place $\overset{Rt}{1^h\ 25^m\ 0^s}$ + 20° 0′

DM Stars + No reference to other catalogues

Zone 19°	No. 238	6.7	1	19	~~40~~ 50	19	25		343 ~~40~~ 30
19°	245	8.3	1	22	48	19	50		
20°	234	9.5	1	24	2	20	12	+	
20°	235	9.5	1	24	3	20	15	+	
19°	251	9.5	1	25	15	20	3	+	
19°	252	8.8	1	25	16	19	44		
19°	258	9.1	1	26	30	20	6		
	259	9.5	1	27	0	20	1	+	
20°	245	9.0	1	28	11	20	8	+	
19°	269	8.5	1	30	29	20	4		

25
63
88

Nov. 23

Computed Place 1 23 0 19° 42′

Cat. list	[illegible]	Cat	[illegible]	[illegible]	2 nights	1	0	[illegible]	[illegible]	
20	12	16	0	42	4	6	14	66	47	70%

Progress of Catalogue Bright Stars

	Finished.			2ds.	1ds.	[illegible]	Sheets.	Comp. with *	per ct.
Feb. 5th	25	15	40	8	23	98	171	53	30
" 20th	25	37	62	9	16	84	171	73	43
Mar 10th	25	~~40~~ 46	~~67~~ 71	8	12	81	172	80	47
" 26th	25	64	89	11	17	74	191	102	53
Apr 20th	25	72	97	9	13	72	191	107	56
May 9th	~~58~~ 58 + 16 + 3 + 25		127	7	8	49	191	134	70
June 1st			132	9	8	43	192	143	75
July 1st			154	10	10	18	192 3	167	87

Faint Stars

	18 — 24		1 —		1	2	4	9	No est.			%
Feb. 5th		26	5	4	30	3	8	10	17	68		50
	5	1–3	5	1–3								
" 7th	29 + 12		8	0	~~48~~ 43	4	10	6	17	80	49	61%
" 20th												
	Cent	incomp										
Mar. 10th	20	12	16	0	48	4	6	14	0	72	50	
June 1st					64	0	2	14	0	80	65	.81
July 1st					68?	1	3	8	0	80	~~70~~ 75	87

23

22 46 57 -12 16 Sat. foll. 280 9'S

231

Malutis Jul 7th 78

Stars mistaken for Satellites of Mars.

Aug. 26th	Holden.							
" 28th	"							
Sept. 13th.	Boully	Nat. 477.						
" ~~15.~~	~~E. C. P.~~							
" 2.	Erck	7"	23h G.S.T	290°	80"			
Aug 17th	Hall.		23	25	37	−10	39	31
Oct 2d	"		22	47	25	−12	24	40
Aug 30th								

Oct 16th Melbourne. 12 15

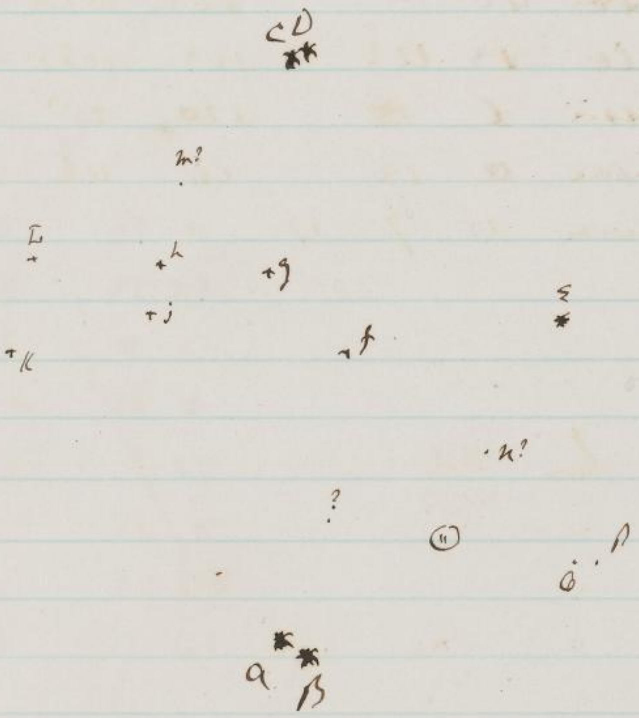
Minima of Algol

		Berl. M. T.		-4 54 C. M. T.	
Nov	11	~~18~~	~~42~~		
	14	~~15~~	~~31~~		~~10~~
	17	~~12~~	~~20~~		~~26~~
	20	~~9~~	~~9~~		~~15~~
	23	~~5~~	~~58~~	~~1~~	~~4~~
Dec	4	~~17~~	~~16~~	~~12~~	~~22~~
	7	~~14~~	~~5~~	~~9~~	~~11~~
	10	~~10~~	~~54~~	~~6~~	~~0~~
	13	~~7~~	~~43~~	~~2~~	~~49~~
	24	~~18~~	~~59~~	~~14~~	~~5~~
	27	~~15~~	~~46~~	~~10~~	~~52~~
	30	~~12~~	~~36~~	~~7~~	~~42~~

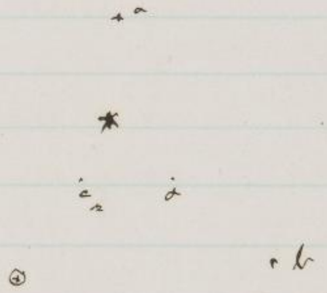
				Dec.		
Dec.	7	14	5	7	9	11
	10	10	54	10	6	0
	13	7	43	13	2	49
	16	4	32	15	23	38
	19	1	21	18	20	27
	21	22	10	21	17	16
	24	19	00	24	14	6
	27	15	49	27	10	55
	30	12	38	30	7	44

S. Ceti.

Nov 4.	12	40
" 23	11	53
Dec 12	11	6
" 31	10	20



ε Lyrae



α Lyrae   Sept 6th '76

Stars with Minute Compan.

α Lyrae.	1	11						
α Aquilae.	1			323	152.6			
α Cygni.	1	12½		102	108.5			
β Aquarii	3	15		320	25"	21	23	[illegible]°
α Aquarii	3	13		44	116"	21	57	− 1
β Capricorni	3.5	7	17			20	12	− 15

e	Sm.	Lam.	Wol. Sept 5th 187[illegible]
f	"	"	"
g	"	"	"
h		"	" 14½
j		"	" "
k		"	" 16
l			" 17½
m			?
n			?
o			"
p			"
q			?

2,2,2 C – $\overset{P}{2.12}$ $\overset{S}{1.84}$ $\overset{P}{2.14}$ $\overset{S}{1.86}$

c 2 2 2 – P J.12 S $\overset{P}{J29}$ $\overset{u}{J29}$ Tel.5 P u "

c 2,2 2 P J29 J29 5 "

c 3,3,3 – $\overset{P}{J29}$ $\overset{S}{J29}$ $\overset{u}{J29}$

C,2,2 – $\overset{P}{2.38}$ $\overset{P}{J12}$ S $\overset{P}{J.12}$ P

C1,1. 128 $\overset{P}{J12}$ P,u,S

–

C2,3,2 – P ab ring

C – $\overset{P}{1.58}$ $\overset{P}{1.53}$ $\overset{S}{1.16}$ $\overset{S}{1.29}$ $\overset{P}{J12}$

2,2,2 – P J29 J29 $\overset{P}{Tel4}$ u $\overset{P}{Tel5}$ u

1 $\overset{P}{1.62}$

x

Bright Stars with Minute Companions.

Σ S m		RA	Dec.	A	B	Pos. angle	Dist.
112 –	α Andromedae.	0 0	+28	1	11	267°	65"
–	β Cassiopeiae	0 0	+58	2½	11	340° ~~201~~	201
–	γ Pegasi a b	0 5	+14	2½	13	300	181
	ι Ceti	0 11	–10	4	15	12	45
	δ Androm	0 30	+30	3	11½	208	122
Burnham						300	28
Σ	α Cass	0 31	+56	3	10½	278	97
	β Ceti	0 35	–19	2½	12	221	542
–	γ Cass	0 47	+60	3	~~15~~ 13	~~348~~	?40" 350
	μ Androm	0 49	+38	4	1[illegible]	115°	45
–	β Andromedae	1 0	+35	2	12	299	225
Burnham	θ Ceti	1 18	–9			60	[illegible]
	α Trianguli	1 44	+29	3½	11	179	110
–	β Arietis	1 46	+20	3	11	199	Diff RA. 7.4
		"	"	"	S.M.	S.F.	[illegible]
–	α "	1 58	+23	3	11	107	Diff RA. 19.5
–	o Ceti	2 11	–4	Var	10	89	116
	ν "	2 27	+5	4½	15	85	6

↑

- not visible! 3 others on R 43, 45

2 2 2 b f3 f3 P.S.
2 2 – c " "

3 2 – P.S.
– B3
C 2, 3 2 – P.S.

–

C 2 2 2 – P.S. P.S. Fd 6 P S Fd 2 P S Fd 26 P u

C 2, 3 – P.S.

	Name	R.A.	Dec.	A.	B.	Pos. angle	Dist.
	ν Persei	2h 53m	+53°	4	14	226°	5.5"
–	α Ceti	2 54	+3	2½	10	258	Diff R.A. 29.6
–	β Persei	2 58	+40	Var.	11	195	55
–	ζ "	3 44	+31	3	10	207	13
						145	37
–	Burnh 40 Eridani	4 10	–7		12	198	83
					11	185	121
	ν Tauri	4 11	+15	3½	11	271	Diff R.A. 17.8
–	α Tauri	4 26	+16	a 1	12	36	108
		Burnham faintest obj seen		b		107°	3[illegible] 2[illegible]
–	β Eridani	5 0	–5	3	12	147	120
–	α Aurigae	5 5	+46	1	12	150	165
	β Orionis	5 9			9	347	45.0
–	β Tauri	5 16	+28	2	10	225	Diff R.A. 14.5
–	γ Orionis	5 16	+6	2	15	150	178
				R	E		
	θ "	5 27	–5	6	15	311	13
–	ι "	5 28	–6	3½	11	103	49
					8½		
	σ "	5 31	–3	4	11	236	12

Other comparisons

A

1 — Mar 8

—

—

2,1,1 — b

—

—

2 2 — b

3 2 c

1 2 d

2 —

—

3 2,2 —

—

—

2 2 —

2,1, -

—

17-18

2 2,1 —

A

— α Tauri

	Name	R.A.	Dec.	A	B	Pos. angle	Dist.
—	– α Orionis	5^h 46^m	+7°	1+	11	155°	160″
B	" "					348°	77″ s?
	~~– γ Geminorum~~	6 28	+16	3	13	335	75
					12	290	110
	α Canis Majoris	6 38	−16	1	10	45	130
	" "					114°	71″
—	– ~~α~~ β " Minoris	7 18	+9	3	12	80	35
					10	312	105
	– α Geminorum	7 24	+32	[3, 3½]	11	162	73
	– α Canis Minoris	7 31	+6	1½	8	85	145
B Bm						317	42″
	– β Geminorum	7 36	+28	2	12½	67	130
					11½	74	203
B Burnham						275	43
Probably	δ Cancri	8 36	+19	4½	15	163	25
same B						121	46″
	– ~~ι Ursae Majoris~~	8 48	+49	3½	13	348	12
B	ε Hydrae	8 40	+6 52	3.4		192	15″
	– ~~α Hydrae~~	9 20	−8	2	10	155	285
B	41 Sextantis ~~5~~	10 44	−8 16	5		303	27
	– ~~β Ursae Majoris~~	10 52	+57	2	11	173	75
	– ~~α " "~~	10 54	+63	Varying color 1½	8	204	381
	– δ Leonis	11 5	+21	3	13 [9]	50	Diff R.A. $4^s.9$

A

Name	R.A.		Dec.	A	B	Pos. angle	Dist.
~~δ Crateris~~	11	11	−14	3½	11	94	Diff. R.A. $19^s.8$
γ Crateris	11	17	−17	4	14	102	3
~~λ Draconis~~	11	21	+70	3½	12	345	Diff. R.A. $17^s.5$
~~β Virginis~~	11	42	+2	3½	11	285	Diff. R.A. $13^s.1$
– o "	12	8	−5 3				
– ~~δ "~~	12	47	+4	3½	10½	144	Diff. R.A. $5^s.8$
– ε "	12	54	+12	3½	Blue 15	124	229
α "	13	16	−10	1	10	57	Diff. R.A. $19^s.4$
– ~~η Boötis~~	13	47	+19	3	10½	118	124
– α "	14	8	+20	1	11	49	Diff. R.A. $15^s.1$
ρ "	14	26					
– ~~β Ursae Minoris~~	14	51	+75	3	11	5	165
– ~~β Boötis~~	14	56	+41	3	11	311	593
– ~~β Librae~~	15	8	+9	2½	12	85	570
– α Serpentis	15	36	+6	2½	15	1½	50
~~β "~~	15	39	+16	3½	10	264	31
~~ζ Ursae Minoris~~	15	$\overset{50}{49}$	+78	4	11	210	310

A

–P –4 P P P
[illegible] 3.612 1.912

2.1.1.1 n13, n13, D9 1.07² J5

3.3.2 ~~n13 n13~~

3.1.2 n13 n13 n13 $\overset{P}{D}9$ D9 D9 J5 J4 J5

3.1² n13 n13 n13 $\overset{P}{D}9$ J5

n13 n13 n13 $\overset{P}{D}9$ J5

A

		R.A.		Dec.	A	B.	Pos. angle	Dist.
	σ Coronae	16	9	+34	[6, 6½]	11	AB 108 AC 90	43
B	" "					17		20
–	η Draconis	16	22	+62	3	11	31	190
B	η Herculis ~~η Ophiuchi~~	17	1	+16	2½	13	260	269
–	~~β Draconis~~	17	27	+52	2	10	101	Diff. RA. $29^{s}.8$
–	~~ν "~~	17	53	+52	2	12	123	Diff. RA. $9^{s}.7$
–	μ¹ Sagittarii	18	4	+21	3½	16	260	10
						9½	315	40
						10	114	45
B							115	30
Σ –	η Serpentis	18	13	+3	4	13	77	111
	~~δ Ursae Minoris 18~~		24	+87	3	12	149	Diff. R.A. $53^{s}.7$
" –	Σ α Lyrae Winnecke	18	31	+39	1	11	135 300	43 47
	ε "	18	39	+40	5	6½	25	3½
≡						5	172	207
						5½	CD 157	3
	ν "	18	53	+32	3	11	23 278 nearly [illegible]	Diff. RA. $3^{s}.7$ 10.0
–	ζ Aquilae	18	58	+14	3	11	84	Diff. RA. $8^{s}.4$
	δ "	19	17	+3	3½	11	259	96

59 46

p u p g
2,2,1 C 1,510 1.554 .94 .664

C

u p p
1,1,1,1 1.953 ~~1.07~~ .137 ~~.94~~

p u p p s
2,2 C .416 .578 .57 2.376 2.098

C

3 h13 h13 h13.

f12 p1243 1561 1464 p 1,608 p s p
3,2,1 C 2 2.426 — — 2.426 2,534 ~~1.803~~ f12 f14
p p
3.2 C 6.44 .57. 588 243 1.803 f14

p u p c p s
2,2,2 2.402 2.290
1 1.73
1 2.462
1.28
p g p
2,1,4 C .836 .838 .84 .916 .954 .830 692
1
b .40 270 8.02

too bright

CC 2,2,1 7.42 7.28

s p p s p
C 2,2,1 1.250 1.352 1.046 .986 f14
1
2 7.44 7.84 (652 b1
s p s
2 2 283 291 1.99 1.45
p s p s p s
C 2,2,2 4.81 .575 2.006 2.288 f12

s p p s
2 2 2 f12 f14 f16

A

		R.A.		Dec.	A	B	Pos. angle °	Dist.
" —	γ Aquilae	19	39	+10	3	12	255	136"
						13	10°	20
	χ Cygni	19	40	+33	5	9	73	26
~~Σ~~ ' —	α Aquilae	19	43	+8	1½	10	323	153
	β "	19	49	[illegible]		15 ~	290	130.
							7°	11."3
not seen	o² Cygni	20	49	+46	4	16 "	330	15
						[7½–5½]	ac 174	107
							aD 334	338
	:α² Capricorni	20	9	~~+~~ −13	A 3 B 4	16	Aa. 145	5
							Aa. 156	198
						[9ᵃ, 9½ᵇ]	AB 291	373
							Bb 222	43
'''	β² "	20	12	−15	3½	17	Abt. 300	140
						[7]		
''''	β Delphini	20	30	+14	4	15	105	15
Σ '''						12	342	30
''	α "	20	32	+15	3½	13	118	105
|| —	α Cygni	20	36	+43	1	12½	102	108
	γ Equulei	21	4	+5			10	41
	η Cephei	20	42	+61	3½	13	29	45
Σ	δ Equulei	21	8	+9	4.1	10.7	29	~~37~~ 27
" —	β Aquarii	21	23	−6	3	15	320	25
	B	"	"	"	"		186	55"
" || —	ε Pegasi	21	36	+9	2½	14	327	85
Σ	κ Pegasi	21	39	+25		9	324	138
					3.9	10.8	~~11~~	~~309~~
	υ Cygni	21	39	28			309 262	11 35
'''' —	α Aquarii	21	~~57~~ 58	−1	3	13	44	116
	γ	~~2~~						
	γ "	22	13	−2	4	14	130	40

2 2 α Pegasi. $\overset{u}{.887}$ α $\overset{s}{.744}$ ξ $\overset{P}{g16}$ ξ $\overset{g}{g16}$ g

1,2,1 $\overset{P.1}{.242}$ α Pegasi. $\overset{s}{.732}$ $\overset{u}{1.175}$ P P

C 1,2,2 $\overset{P}{1.040}$ $\overset{s}{1052}$ $\overset{P\ S}{g12}$

2 2
2,2.
2,2,2

A

		R.A.	Dec.	A.	B.	Pos. angle	Dist.
	ζ Pegasi	22^h 33^m	+ 10°	3	13	15°.	65"
Too faint	ξ "	22 39	+ 11	5	15 12	120 32	15 110
11 =	β "	22 56	+27	2	15	199	75
=	α "	22 57	+14	2	11	305	Diff. Rat. $17^s.2$
	~~γ Cephei~~	~~23 33~~	~~+77~~	~~3~~	~~14~~	~~270~~	[Not taken]
—	η Cephei	20 42	61	3½	13	29	.45
	γ Cephei	23 33	+77	3	15	180°	60"±

Stars brighter than 3.4 m having faint compan

	R.A. h	m	Dec.		Mag.	Sm.	Lam.
α Andromedae	0	2	+28°	24′	2	1	-
β Cassiopeae	0	3	+58	28	2.3	1	-
γ Pegasi	0	7	+14	30	3.2	1	-
α Cass.	0	33	+55	51	2.3	1	-
β Ceti B.A.C. 196	0	36	-18	49	2½		
γ Cass.	0	49	+60	3	2	1	4
β Andro.	1	3	+34	58	2.3	1	-
α Ursa Mi.	1	13	+88	39	2	[illegible]	-
δ Cassiopeae	1	18	+59	35	3	—	-
δ Ceti	1	1.8	-8	47	3	-	-
ε Cass.	1	44					
ξ Ceti	1	44					
β Arietis	1	48	+20	12	3.2	1	-
γ Androm.	1	56	+41	44	2.3	-	-
α Arietis	2	0	+22	53	2	"	-
β Trianguli	2	2	+34	25	3	—	
o Ceti	2	13	-3	32	2...9	1	
γ Ceti	2	36	+2	36			
41 Arietis	2	41	+26	38			
η Eridani	2	50	-9	23	3	—	

within 2' and north of 30°S

Mag.	Ang.	Dist.
11	267	65"
11	340	201'
13	300	181
10½	278	97

	R.A.		Dec.		Mag.	Sun.	Lune.
α Ceti	2h	56m	+3°	37′	2.3	/	
γ Persei	2	56	+53	2	3	–	
β "	3	0	+40	29	2...4	/	
α "	3	16	+49	26	2	–	
ε Eridani	3	27	−9	52	3	–	
δ Persei	3	34	+47	24	3	–	
η Tauri	3	40	+23	44	3	–	
ζ Persei	3	46	+31	31.	3	3	
γ Eridani	3	51	−13	56			
α Tauri	4	29	+16	16	1	1	
ι Aurigae	4	49	+32	58	3	–	
β Eridani	5	2	−5	15	3	1	
α Aurigae	5	8	+45	52	1	2	
β Orionis	5	9	−8	21	1	–	
β Tauri	5	19	+28	30	2	1	
γ Orionis	5	19	+6	14	2	1	

B

		R.A.		Dec.		Mag	Sm.	Lum.
	δ Orionis	5h	26m	−0°	23′	2.3	—	
4	ι "	5	29	−5	59	3	2	
	ε "	5	30	−1	17	2	—	
	ζ "	5	32	−2	1			
	α Columbae	5	34	−34	9			
	κ Orionis	5	42	−9	43	3.2	—	
	β Columbae	5	45	−35	50			
	α Orionis	5	49	+7	23	1	1	
	β Aurigae	5	51	+44	56	2	—	
	θ "	5	51	+37	12	3	—	
	μ ~~η~~ Geminorum	6	16	+22	34	3.~~4~~2	—	
	~~ζ~~ Canis Majoris	6	15	30	0			
	β "	6	16	37	53			
	γ Geminorum	6	31	+16	30	2.3	2	
	α Canis Maj	6	38	−16	16			
	ε "	6	53	−28	46			
	~~β~~ Canis Min.	7	21	+8	32	3	2	
	δ Geminorum	7	11	+22	15			
	β Canis Minoris	7	19	+8	25			
	α Geminorum	7	27	+32	9	2.1	~~3~~ 1	
	α Canis Min.	7	33	+5	32	1	1	
	β Geminorum	7	38	+28	19	1.2	2	
	ι Ursae Maj.	8	51	+48	31	3	1	
	α Hydrae	9	22	−8	8	2	1	

B

10 45 150
12 8 35

	R.A.		Dec.		Mag	In.	Lum.
θ Ursae Majoris	9h	25m	+52°	14'	3	–	
ε Leonis	9	39	+24	20	3	–	
μ Leonis	9	44	+26	43			
α " my W. 26ins.	10	2	+12	34	1.2	–	
ζ "	10	10	+24	1	3	–	
γ "	10	12	+30	36			
μ Ursae Majoris	10	15	+42	7	3	–	
β " "	10	54	+57	2	2.3	1	
α " "	10	56	+62	25	2	1	
ψ " "	11	3	+45	10	3	–	
θ Leonis	11	6	+16	15			
δ Leonis	11	8	+21	11	2.3	2	
β "	11	43	+15	15	2	–	
γ Ursae Majoris	11	47	+54	22	2.3	–	
δ Corvi	12	22					
β	12	26			2½		
η Virginis	12	35	–0	47	3	–	
ε Ursae Majoris	12	49	+56	37	2	–	
δ Virginis	12	49	+4	4	3	1	
12 Canum Venaticorum (Seq)	12	50	+38	59	3	–	

B

			R.A.		Dec.		Mag.	Sm.	Lam.
	ε	Virginis	12	56	+11	37	3.2	/	
	α	"							
	ζ	Ursae Majoris pr.	13	19	+55	34	2.3	–	
	η	" "	13	43	+49	55	2	–	
	η	Bootis	13	49	+19	1	3	/	
	α	"	14	10	+19	49	1	/	
	γ	"	14	27	+38	51	3.2	–	
	ε	"	14	38					
	α	Librae	14	43					
23	β	Ursae Minoris	14	51	+74	39	2	/	
	β	Bootis	14	57	+40	52	3	/	
	β	Librae	15	10	−8	56	2	/	
	δ	Bootis	15	11	+33	46	3	–	
23.3	γ	Ursae Minoris	15	21	+72	16	3	–	
21.4	ι	Draconis	15	22	+59	24	3	–	
	δ	Serpentis	15	27					
	α	Coronae	15	30	+27	8	2	–	
	α	Serpentis	15	38	+6	49	2.3	/	
	ε	"	15	43					
	γ		15	49					
	ξ	Scorpii		51					
	δ	Ophiuchi	16	8	−3	23	3	–	

B

		R.A.		Dec.		Mag.	Sm.	Lum.
		15..	56					
	β Scorpii							
		15	57					
	θ ~~Draconis~~ ε Ophiuchi	16	10					
20.6	γ Herculis	16h	17m	+19°	26′	3	–	
	α Scorpii	16	20					
23.4	η Draconis s.f.	16	22	+61	47	3.2	1	
20.9	β Herculis	16	25	+21	45	2.3	–	
21.8	ζ "	16	37	+31	49	3.2	–	
22.1	η "	16	39	+39	9	3	–	
		16	63					
0.0	ζ Draconis	17	8	+65	52	3	–	
21.9	δ Herculis	17	10	+24	59	3	–	
23.8	β Draconis	17	28	+52	24	3.2	1	
21.5	α Ophiuchi	17	29	+12	39	2	–	
21.0	β "	17	37	+4	37	3	–	
0.1	γ Draconis	17	54	+51	30	2.3	1	
20.1	η Serpentis	18	15	–2	56	3	1	
0.0	α Lyrae	18	33	+38	40	1	1	
23.0	ζ Aquilae	19	0	+13	41	3	1	
2.9	δ Draconis	19	13	+67	27	3	–	

B

		R.A.		Dec.		Mag.	Sm.	Lam.
0.2	β Cygni	19	26	+27	42	3	–	
23.6	γ Aquilae	19	40	+10	19	3	~~2~~ 2	
4.5	δ Cygni	19	41	+44	50	3	–	
23.4	α Aquilae	19	45	+8	33	1.2	2	
23.1	θ Aquilae	20	5	–1	11	3	–	
1.8	γ Cygni	20	18	+39	52	3.2	–	
2.4	α "	20	37	+44	51	2.1	1	
1.7	ε "	20	41	+33	31	3.2	–	
2.1	ζ "	21	8	+29	44	3	–	
4.3	α Cephei	21	16	+62	4	3.2	–	
0.1	β Aquarii	21	25	–6	6	3	1	
5.6	β Cephei	21	27	+70	1	3	–	
1.4	ε Pegasi	21	38	+9	19	2.3	2	
1.1	α Aquarii	22	0	–0	55	3	1	
3.6	η Pegasi	22	37	+29	35	3	–	

B

		R.A.	Dec.	Mag.	Sm.	Lam.
3.8	β Pegasi	22 58	+27 25	2.3	1	
3.0	α "	22 59	+14 33	2	1	

B

List of Double Stars for Student's Meas

	Name	R.A. h	m	Dec °	'	Mag		Dist	Ang
4.4 4 2 4 2	α Androm.	0	2	+28	24	2.0	11.2	65"	267°
C 卌 1	51 Piscium	0	25.8	+6	15	5.0	9.0	27	82
2.2.2.2.4 C 6.3.4	π and middle α Cassiopeiae	0	33.4	+55	51	2.5	10.0	diff R.A. 6.7s	279
C 卌 1	55 Piscium	0	33	+20	45	5.0	8.2	6	193
C 4.2.2 ✓ ||||	η Cassiopeiae	0	41	+57	9	4.0	7.6	10	89
C 4 2 4 ||||	ψ¹ Piscium	0	59	+20	48	4.9	5.0	30	160
6.2.1.4 C 卌 1	φ "	1	7	+23	56	4.7	10.1	8	228
C 4 4 2 |||| 1	ζ "	1	7.2	+6	55	4.2	5.3	23	64
C 4.4.4	α Ursae Min.	1	13	+88	39	2.0	9.0	18	210
C 3.6.4.4 14.5 2	ψ Cassiopeiae	1	17	+67	30	4.4	8.9	32	102
6.4.2 2 C 卌 1	γ Arietis	1	47	+18	42	4.2	4.4	9	0
C 4.4.2	λ "	1	51	+23		4.9	7.7	Δ RA 2.0s	46
C 3.2.4.4	ε "	1	52	+20	49	5	7.5	1	200
卌 close Clo	α Piscium	1	56	+2	9	2.8	3.9	4	336
4.4 2	γ Andromedae	1	56	+41	44	3.0	5.0	10	62
6.2.4 卌 1	ι Trianguli	2	5	+29	43	5.0	6.4	4	78
2.2.2	ο Ceti	2	13	—3	32			Δ.RA. 7.7s	89
2 2 4 2	ι Cass. 35 Hev.	2	19	+66	51	4.2	7.1	2	277
2 1 4 4 ½ 242	triple ω Fornacis	2	28	−28	57	5	8	11	242
C 2 3 1 2 2	ν Ceti	2	28	+5	2	5.0	9.6	8	83

C

Much brighter than the 5.0 mag.

1 2 3 4 5 6 7 8 9 10

P S P S

fr dir

s s u u P P

12.12 11.32 11.75 10.70 9.52 9.75 9.37 10.42 11.82 11.92

10.70 10.95

P P

fr

P P s s u u P P P

12.62 11.10 11.15 11.42 12.77 13.15

8.35 8.55 9.25 9.13

P P u u

41.57 41.25 39.20 40.95

u u s s P P

fr 5.42 4.97 5.20 4.72 5.62 6.00

P P u u P s

31.87 32.52 33.60 34.57 31.47 30.55 33.55 32.27 33.6 34.1

P P P P P S P S

n

P P u u s s

44.93 47.22 41.62 42.07 43.80 44.22

P S P S ~~P~~ P

~~[illegible]~~

P s u P P

[illegible], 32.37 30.80 3[illegible]7 3[illegible]

s s u u P P

26.37 22.75 25.90 23.50 25.00 26.32

P P

C

S S [illegible]

77.0

		R.A.		Dec.		Mags.		Dist.	Angle
~~6.4.4~~	θ Persei	2^h	36^m	+48°	43′	4.2	10.0	15″	295°
2.1.2.2 ~~2.2.2~~	γ Ceti	2	37	+2	42	3.0	6.8	3	287
~~6.2.4~~	η Persei	2	42	+55	23	4.0	8.5	28	300
4,4,4	~~π Arietis~~	~~2~~	~~42~~	~~+16~~	~~58~~	~~4.9~~	~~10.2~~	~~25~~	~~110~~
~~4.6.2~~	π Arietis	2	42	+16	58	4.9	8.4 10.2	3 25″	119 110. a.c.
C 4.4.2	~~θ Eridani~~	~~2~~ 3	~~53~~	~~−40~~ −29	~~50~~ 30	~~5~~ 3	8	~~2~~	~~81~~
~~4.4.2~~	41 "	2	43	+26	45	5.0	9.0	Diff RA +7.0	....
	ε Arietis	2	52	+20	49				
4.4.2	2 Hev. Camelop.	3	19	+59	30	4.7	9.0	2.4	161
2 4 4	4 " "	3	20	+55	1	4.8	9.2	15	160
6 4 4	o Persei (= H III. 39)	3	34	+33	34	4.2	9.5	20	237
	20, 19 Tauri (w Egt.)								
~~6~~.6.2 4.2.2	η Tauri	3	40	+23	44	3.8	7.0	117 ~~117~~	289 289
~~2.4.4~~	30 "	3	41	+10	46	4.5	9.6	9	58
	27, 28 Tauri (w Egt.)								
C	27 "	3	42	+23	39	5.0	8.0	0.8	107
	f Eridani	3	44	−38	1	5	5	9	200
~~6.4.4~~	ζ Persei	3	46	+31	30	2.7	9.3	12	208
~~2.4.4~~	32 Erid. (H. II 36)	3	48	−3	18	4.0	6.0	7	347
~~4.2.4~~	ε Persei	3	49	+39	39	3.1	8.3	9	9
~~2.4.4~~	39 Eridani	4	8	−10	35	ε mag. = 6.0 5	11 (b)	7	154
~~2.4.4~~	40 Eridani	4	10	−7	48	4.0	9.1	85	107
	κ¹, κ² Tauri (w. Egt.)								
2	~~χ, χ Tauri~~ 1, 2	4	18	+21	59	5.0	6.0	339	173

1 2 3 4 5 6 7 8 9 10

ft.

S S P P P S
18.55 15.07 14.35 19.27 14.55 14.85

P S P S

c

cf

f

f

d

f P 8.77 P 8.55

c Seen not meas

f

P P

f d dbe appt

d

		R.A.		Dec.		Mags.		Dist.	Angle.
*	θ¹θ² Tauri	4h	21m	+15°	38′	4.7	5.0	337″	346°
2 4	88 Tauri	4	29	+9	54	5	8.5	68	300
* 1,4	α " =H.VI.66	4	29	+16	16	1.0	11.2	109	36
2,42,?	τ Tauri	4	34	+22	42	5	8	62	210
+ 4,42	γ Camelopardalis	4	47	+53	32	4.2	11.3	26	238
4 42	ω Aurigae	4	51	+37	43	4.0	7.9	6	352
*	11 & 12 Camelop.	4	55	+58	49	5.0	6.0	181	7
	β Eridani	5	0	−5½°		3	12	120	147
4,4.4	19 Hev. "	5	2	+79	4	4.5	7.9	34	349
C 3	Σ 655 Leporis	5	7	−12	1	4.2	10.5	13	338
C 4,4,4	ρ Orionis	5	7	+2	45	4.7	8.5	7	63
C 4,4 2	14 Aurigae	5	7	+32	33	5.0	7.2	15	225
2,2,2	κ Leporis	5	7	−13	5	5.0	7.9	3	359
C 2 4 4	β Orionis	5	9	−8	21	1.0	8.0	9	200
C 4,4 4	23 "	5	16	+3	24	5.0	7.0	32	28
close η	~~η 32 "~~	~~5~~	~~18 24~~	~~−2~~	~~21~~	~~4~~	~~5 7~~	~~1~~	~~84 246~~ below 5.0 Σ
C 2 4 3	δ "	5	26	−0	23	2.0	6.8	53	359
C 4 4 0 4,4 4	λ "	5	28	+9	51	4.0	6.0 12.0	4. 27 S. South	40 184
C 2 2 3	θ′ "	5	29	−5	30	7.0	8.0 B 4.7 C 6.3 D 11.3 E	13 DC 9 AB 13 AC 21 AD 17 BC 19 DB	240 DC 32 AB 132 AC 95 AD 162 BC 280 DB

d

ftd

ft

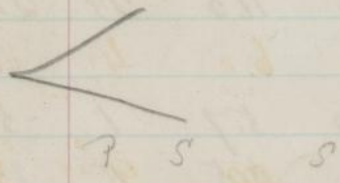
d

ft

c

J. 2ch

d $\overset{P}{6.62}$ $\overset{P}{6.87}$



		R.A.		Dec.		Mags		Dist	Angle	
~~4.4.~~	~~θ² Orionis~~	5h	29m	−5°	30′	4.8	6.1	53″	92°	
d	~~θ¹θ²~~ "	5	29	−5	30	....	....	135	314	
4 4 ~~64~~ 4	ι "	5	29	−6	1	3.2	7.3	11	142	
6,4,2	14 Aurigae two comps	5	30	+30	25	5	8	12	268	
~~c 4 4 2~~	σ "	5	32	−2	41	4.1	10.3	11	237	
~~c 4 4 2~~							7.5	13	84	
~~c 4 4 2~~							7.0 D	30	231	DC
2,4 4	ζ "	5	35	−2	2	2.0	5.7	2	153	
4	ν Leporis	5	39	−22	30	4	6.5	93	349	
4 4 4	8 Monocerotis	6	17	+4	40	4.0	6.7	14	26	
4,4,2 4,44	11 "	6	23	−6	56	5.0	5.5	7	130	
							6.0	2.5	102	BC
4.4.4	ε Geminorum	6	36	+25	15	3	9.5	94	111	
2,3,	μ Canis Majoris	6	50	−13	53	4.7	8.0	3	344	
2 4 2	λ Geminorum	7	11	+16	46	3.2	10.3	10	31	
C 4 2 4	δ "	7	12	+22	12	3.2	8.2	7	197	
c 2,6,	α "	7	27	+32	9	2.7	3.7	4	263	
d 6,4,	{Castor following A and C} "						9.5	73	162	
2 4 24	κ Puppis	7	34	−26	29	5	6	10	138	
2,4	κ Geminorum = H.VI. 42.	7	37	+24	44	4	10	6	232	
df	β Geminorum	7	38	+28	19	2.0	11.0	204	74	
f 6,4,2	π "	7	39	+33	42	4.9	11.0	23	212	
c 3,6 4	ζ Cancri	8	5	+18	2	5.0	5.7	1	58	
							5.5	5	155	ac

C

d

d

P S P S

+

~~c~~

Triple

c

+

+

+

~~c~~

		R.A.		Dec.		Mags.		Dist.	Angle
2,4,4	48 ι Cancri	8h	39m	+29°	13′	4.4	6.5	30″	307°
4,4	ε Hydrae	8	40	+6	54	3.8	7.8	3	196
2,2	ι Ursae majoris	8	50	+48	33	3.5	13	12	146
2,4,3-2	σ^2 Ursae Majoris	8	59	+67	39	5.0	8.2	5	264
4,4,4	38 Lyncis	9	11	+37	20	4.0	6.7	3	240
2,2,4,2	23 h Ursae Maj.	9	22	+63	36	3.8	9.0	23	272
2,4,4	α Leonis	10	2	+12	35	1.5	8.4	177	307
	ζ + 35 "	10	10	+24	6	3.8	6.0	314	343
2,4,4	γ "	10	13	+20	29	2.0	3.5	2	103
4,2,4	54 "	10	49	+25	26	5.0	7.0	6	103
	α ~~Ursae~~ majoris ([illegible])								
2,4,2,4	ξ Ursae Majoris	11	11	+32	14	4.0	4.9	2	239
2,4,4	ν " "	11	12	+33	46	3.7	10.1	7	147
2,2,4	ι Leonis	11	17	+11	13	3.9	7.1	2	92
2,4,4	83 "	11	20	3	42	6.3	7.3	30	150 1[illegible]0
2,4,4.	τ "	11	21	+3	33	5.0	7.0	95	170
4,2,4	93 "	11	41	+20	55	4.7	8.4	74	355
	β ~~Crateris~~ Hydrae	11	46	−~~33~~ 23	11	5	5	2	340
	~~17 Com. Ber.~~								
	17 Com. Ber. ~~& P. XII. 96.~~	12	23	+26	36	4.8	6.0	145	251
4,4,2	δ Corvi	12	23	−15	39	3.0	9.0	24	211

C

~~c~~

ρ+ $\overset{\delta}{\underset{\delta}{\vdots}}$ $\overset{u}{u}$, S, $\overset{u}{u}$, ρ S P

c

f

~~c~~

c

f

~~c~~

f

		R.A.		Dec.		Mags.		Dist.	Angle.
2 4 4	24 Comae Berinices	12h	29m	+19°	5′	4.7	6.2	20″	272°
4.4.4	γ Virginis	12	35	−0	45	3.0	3.0	5 2	278
4.4.2	35 Comae Berinicis	12	47	+21	55	5.0	7.8 9.0	1 29	25 125 aC
2 4 4	32 Hev. Camelop.	12	48	+84	4	4.9	5.4	22	327
2,4,4	12 c Canum Venat.	12	50	+39	0	3.2	5.7	20	227
6.4.4 4.4.2	θ Virginis	13	3	−4	52	4.0	9.0	7	344
	ζ 80 Ursae Majoris (w. Eye.)								
2,4,4	ζ Ursae Majoris	13	19	+55	36	2.1	4.2	14	148
4 4 2	κ Bootis	14	9	+52	23	5.0	7.0	13	238
4.4.2	ι Bootis	14	12	+51	57	A & B. 4.9	C. 7.5	38	33
4 4 2	φ Virginis	14	22	−1	39	5	13	5	115
4,4,2	π Bootis	14	35	+16	58	4.9	6.0	6	99
	~~ζ "~~	~~14~~	~~35~~	~~+14~~	~~16~~	~~3.5~~	~~3.9~~	~~1~~	~~309~~
2,1,4,4	ε "	14	39	+27	36	3.0	6.3	3	321
	α Librae (w. Eye)								
4 4 2	ξ Bootis "	14	45	+19	37	4.7	6.6	7	334
4,4,2	44 Bootis	15	0	+48	10	5	6	5	240
4 4 D 2	δ "	15	10	+33	47	3.2	7.4	105	79
4,4,2	5 Serpentis	15	13	+2	15	5.0	10.0	10	41
	μ Bootis & P. XV. 74.	15	20	+37	[47 45]	4.0	[6.7 [illegible]]	[108 1]	[172 327]

C

c

u c

P P

u f

P.S.P.S U
P.S.u.S P
P.S.P.u S
~~S u P.S~~

c

c

~~u~~

u α ~~19~~ ~~49~~ 20 1 14h10

1 P.S u P S
P u S.P

f u.S. P.S P

SEE P. 112.

52,53 Bootis (W. Eq. t. 2.)

	R.A.		Dec.		Mags.		Dist.	Angle.
close. ν Lupi	15	26	−40	44	4	4	1	94
δ Serpentis	15h	29m	+10°	57'	3.0	4.0	3"	197°
ζ Coronae	15	35	+37	1	4.1	5.0	6	301
~~γ~~	~~15~~	~~37.5~~	~~+26~~	~~42~~	~~4.0~~	~~7.0~~	~~1~~	~~111~~
α Serpentis 4,2 —	15	38	+6	48	2.5	15.	50	
β serpentis	15	40.3	+15	47	3.0	9.2	31	265
η Lupi	15	51	−38	2	4	8	15	22
~~ξ Librae~~	~~15~~	~~57~~	~~−11~~	~~2~~	~~4.9~~	~~5.2~~	~~1~~	~~356~~
close. ~~ξ Scorpionis~~	~~15~~	~~57~~	~~−11~~	~~1~~	~~4.5~~	~~5~~	~~1~~	~~178 173?~~
β Scorpionis	15	58	−19	27	2.0	4.0	13	24 ....
κ Herculis	16	2	+17	23	5.0	6.0	31	10
ν Scorpionis	16	4	−19	7	4.	7.	40	338
σ Coronae	16	10	+34	12	5.0	6.1	1	89
σ Scorp. σ Scorpionis	16	13	−25	17	4.	9.5	20, & 30	272
ν¹ ν² Coronae	16	18	+34	2	4.8	5.1	372	166
Distant	16	18	+34	0	5.	12.	137	18
~~λ Ophiuchi~~	~~16~~	~~25~~	~~+2~~	~~15~~	~~4.0~~	~~6.1~~	~~1~~	~~332~~
16, 17 Draconis	16	33	+53	11	5.0	5.0	90	15
17 "	16	33	+53	9	5.0	6.0	4	116
42 Herculis	16	35	+49	10	4.0	10.7	22	92
~~ζ "~~	~~16~~	~~37~~	~~+31~~	~~49~~	~~3.0~~	~~6.5~~	~~1~~	~~23~~
43 "	16	40	+8	48	5.0	9.0	....	230 ....
μ Draconis	17	3	+54	38	5.0	5.1	3	205
36 Ophiuchi	17	7	−26	24	4.5	6.5	5	226
α Herculis	17	9	+14	32	3.0	6.1	5	118
5827 B.A.C.	17	10	−24	9	5.	6.	15	358
4 δ "	17	10	+24	59	3.0	8.1	26	174
ν Serpentis	17	14	−12	43	4.0	8.5	....	....

C

c

u, s. s.
c

c

f

c

f

c

		R.A.		Dec.		Mags.		Dist.	Angle.
	ρ Herculis	17	19	+37	18	4.0	5.1	4	307
2.4	ν¹ν² Draconis	17	30	+55	16	4.6	4.6	62	313
2.4	μ Herculis	17	42	+27	49	3.8	9.5	30	241
4	ψ Draconis	17	45	+72	13	4.0	5.2	31	15
	67 Ophiuchi	17	54	+2	56	4.0	8.0	80	143 ....
	~~τ "~~	~~17~~	~~56~~	~~−8~~	~~10~~	~~5.0~~	~~5.7~~	~~0~~	~~193~~
	95 Herculis	17	56	+21	35	4.9	4.9	6	262
	μ Sagittarii×	17	57	−21	5	3.5	9.5 10	40′ 3.40″ 45	315 114
	70 p Ophiuchi	17	59	+2	33	4.1	6.1	4	148
	21 Sagittarii	18	5	−20	37	5	9	2	287
	η Serpentis	18	14	−2	55	3.3	12.0	113	77
	~~θ Serpentis~~ See next page	18	50	+4	1	40	42	22	104
	59 Serpentis	18	21	+0	6	5.0	8.0	4	314
2.4.4	39 Draconis	18	22	+58	44	4.7	7.7	3	[illegible]
	39 Draconis & Anon.	18	22	+58	45	4.7	7.1	89	22
4.4.4	α Lyrae = H.V.39.	18	33	+38	40.	1.0	10.5	43	138
4.1.4.2	ε "	18	40	+39	33	4.6	6.3	3.	26
	110 Herculis	18	40	+20	26	5	16	55	110
	ε, 5 "	18	40	+39	31	....	....	....	173 ....
1.2.4.2.1	5 "	18	40	+39	29	4.9	5.2	3	155

× 9.5 is copied from P. 102 as companion of μ Sagittarii; not of 21.

C

+

c

‡

- 14.17 16.67 $\overset{P}{14.05}$ $\overset{P}{15.80}$ $\overset{S}{17.10}$ $\overset{S}{20.37}$ $\overset{S}{16.12}$ $\overset{P}{17.92}$ $\overset{S}{16.58}$ $\overset{P}{15.77}$

dist.

p. $\overset{P}{0.15}$

- $\overset{P}{31.82}$ $\overset{P}{33.50}$ $\overset{S}{32.02}$ $\overset{S}{34.10}$ 30.60 | $\overset{P}{29.92}$ $\overset{P}{31.40}$ $\overset{\overset{P}{35.27}}{\overset{S}{33.00}}$ $\overset{\overset{P}{32.95}}{\overset{S}{35.87}}$

dist.

- $\overset{S}{37.25}$ 40.80 39.15 $\overset{S}{44.70}$ $\overset{P}{40.48}$

		R.A. h	m	Dec. °	'	Mags.		Dist.	Angle.
3, 2, 3, 4 C —	ζ Lyrae	18	40	+37°	28'	4.2	5.5	44"	150°
—	β "	18	45	+33	13	3.0	6.7	46	150
3, 5, 4 C	ο Draconis	18	49	+59	15	4.6	7.6	30	346
—	θ Serpentis	18	50	+4	1	4.0	4.2	22	104
4 4 4 C —	η Lyrae	19	10	+38	57	4.0	8.1	28	85
—	6, 8 Vulpeculae	19	24	+24	28	4.4	5.7	396	28
6 4 [2.3] 2	β Cygni	19	26	+27	42	3.0	5.3	34	56
D	ε Sagittae	19	32	+16	11	4.7	7.7	92	81° ....
not seen	δ Cygni	19	41	+44	50	3.0	7.9	2	[illegible]
	17 Cygni	19	41	+33	28	5.0	7.0	26	73
	ζ Sagittae	19	43	+18	50	8 4.3	9.0	8	313
—	α Aquilae	19	45	+8	32	1.5	10.2	152	322
3 4 4	ε Draconis	19	48	+69	56	4.0	7.6	3	355
6, 4, 4 4	ψ Cygni	19	52	+52	6	5.0	7.5	3	185
4 4 4	26 "	19	58	+49	46	4.5	8.2	+2.40	....
D	o^1, o^2 " and P. XX. 63	20	10	+46	22	o^2 3.7	o^1 5.0 6.5	338 107	324 174 a C.
D	$\alpha^1 \alpha^2$ Capricorni	20	11	−12	55	3.2	4.2	375	291

C

P P S P P | P u u
- 29.82 29.10 29.20 31.83 27.68 | 27.05 29.3 27.7
P P S S
27.22 28.02 26.05 25.00

var. -

P S u S S P P a.g.c.
- 12.82 15.50 11.40 15.10 14.32 10.75 9.95 12.95
P P S S
10.85 10.17 12.27 13.32

-

S u u S P S P S
- 11.23 10.12 10.97 10.90 9.30 9.70 10.28 9.08
P P P S
8.57 8.87 9.67 8.77

dist

S P S u u | P P S P S
- 20.75 22.70 21.80 18.50 20.35 | 23.72 20.15 18.77 17.75 20.03
S P P S
21.65 23.77 [illegible] 16.77 17.87 [illegible]

dist

- not seen looked for twice three times

ft-dist

n -

P S u u S | P
- 21.37 18.10 16.27 16.95 15.90 | 19.90

dist.

dist. 36.62 38.05

111 1111 4

		R.A.		Dec.		Mags.		Dist.	Angle
4,2,4 IIII	κ Cephei	20ʰ	13ᵐ	+77°	18′	4.0	8.0	7″	124°
D	β Capricorni	20	14	−15	11	2.5	6.0	205	267
	ρ "	20	22	−18	14	5	10	2	177
1,1,4,4 I	β Delphini	20	32	+14	9	3.0	11.0	32	344
	α Delphini (W.Eght)	20	34						
2,4,4 II	52 Cygni	20	40	+30	14	4.0	9.2	7	57
4,2,2,2 IIII	γ Delphini	20	41	+15	39	4.0	5.0	12	274
— IIIIIIII	59 f¹ Cygni	20	55	+47	2	4.7	9.0	20	352
	61 Cygni	21	1	+38	6	5.0	6.0	15	89
D	γ, 6 Equulei	21	4	+9	36	4.2	5.7	366	153
2,4,4.	δ "	21	8	+9	30	4.1	10.2	27	39
4,2,4 IIII	I Pegasi	21	16	+19	15	4.5	8.6	36	311
4,2,4 IIII	β Cephei	21	27	+70	0	3.0	8.0	14	250
	ε Pegasi (W.Eght.)								
5 2 2 2 — IIIII IIII	μ Cygni	21	38	+28	12	4.0	5.0	6	115
	24. 37 / β. Cygni (W.Eght.)								
4,4,4	κ Pegasi	21	39	+25	5	3.9	10.8	11	309
4,2,4 IIII	ξ Cephei	22	0	+64	0	4.7	6.5	6	289
	π¹ π² Pegasi (W.Eght.)								
4,2,4 IIII	ζ Aquarii	22	22	−0	40	4.0	4.1	4	0
4,2,4 IIII	δ Cephei	22	24	+57	46	3.0	5.3	41	192
	β Piscis Austr.	22	24	−33	1	4	8	29	173
	γ "	22	45	−33	33	4	10	4	277

n − $\underbrace{\overset{s}{12.7}\quad \overset{s}{11.7}\quad \overset{u}{10.8}\quad \overset{u}{10.5}}$

dist △ 12.67 13.30

ft ~~*~~ $\underbrace{\overset{s}{2.70}}\quad \overset{p}{2.02}$

− $\underbrace{\overset{s}{7.85}\quad \overset{u}{6.30}\quad \overset{u2\,tr}{6.85}}$

+ $\underbrace{\overset{p}{34.43}\quad \overset{s}{3033}\quad \overset{p}{31.30}\quad \overset{s}{29.80}}\quad \overset{p}{32.03}\quad \overset{p}{33.00}$

− $\underbrace{\overset{u}{6.30}\quad \overset{2u}{6.6}\quad \overset{s}{6.43}\quad \overset{p}{7.13}\quad \overset{s}{7.10} \mid \overset{p}{7.10}}\quad \underline{8.30\quad 8.03\quad 7.20\quad 8.53\quad 9.10}$

~~dist~~ 7.55 6.80

dist

ft

3.81 4.10

− $\underbrace{\overset{s}{6.17}\quad \overset{p}{4.75}\quad \overset{p}{6.25}\quad \overset{s}{5.25}}\quad \underbrace{\overset{p}{5.05}\quad \overset{p}{5.42}}$

n − $\underbrace{\overset{s}{7.6}\quad \overset{s}{8.5}\quad \overset{u}{7.3}\quad \overset{u}{8.5}}$

− $\underbrace{\overset{p}{28.20}\quad \overset{u}{25.57}\quad \overset{u}{25.70}\quad \overset{p}{28.30}\quad \overset{s?}{26.45}} \mid \underbrace{\overset{p}{31.97}\quad \overset{p}{26.20}}\quad \underbrace{\overset{u}{22.0}\quad \overset{u}{22.5}}$

$\underline{\overset{p}{27.77}\quad \overset{p}{28.40}}$

ft

n − $\underbrace{\overset{u}{22.3}\quad \overset{u}{23.9}\quad \overset{s}{22.6}\quad \overset{s}{22.4}}$

+ $\underbrace{\overset{p}{51.17}\quad \overset{p}{49.35}\quad \overset{u}{44.60}\quad \overset{u}{45.97}}\quad \underbrace{\overset{p}{43.07}\quad \overset{p}{44.43}}$

− $\underbrace{\overset{u}{19.9}\quad \overset{u}{21.5}\quad \overset{s}{17.9}\quad \overset{s}{17.5}}$

		23 R.A. 4	+74 Dec. 41	5 Mags. 10	Dist. 1	Angle (3)
4.2.4	π Cephei ψ' Aquarii	23h 9m	−9° 46	4.5 8.5	50"	312

Repeat.

ψ Cass. .55 1, 4, 3, 2

d ι Cass.? .29

mk η Tauri .26 4, 2, 2, 2 ∴

br β Orionis .27 2, 2, .

δ " .29 2 4, 2, 2, 2

~~br α Geminorum .23~~

~~Ex α Can Maj. .60~~

pr β Delphini .36

o Draconis .27

41 Arietis 33 4

18370

C

7.05 6.95

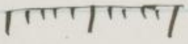
0	45°
1	32.25
2	21.7
3	14.1
4	9.0
5	5.7

Investigations to be undertaken.

I. Faint companions brighter than the 15th m. within 200" of stars brighter than the 3.4 m.

On very clear nights only.
Turn to ε Cygni or other tests for faint stars.
Record objects visible.

Turn to stars in list B or letter card catalogue at the west over 30° altitude giving preference to those to the south. Use low power with dark spot in centre of field. Place star behind this and record all points of light within 200" estimating roughly angles distances and magnitudes. Let second observer verify and detect additional points of light. After observing several stars turn back to original test and record number of stars visible.

II. Positions of objects found in I. When the seeing is not good enough for I observe brighter objects found, by eyepiece having  scale in eyepiece. Measure distance of each star and angle by turning edge of scale parallel to line connecting star and companion and reading angle by position circle.

III Brightness of objects thus found. When seeing is not good enough for I. observe brightness of objects found, by photometer C. These will of course include Smyth's ~~[illegible]~~ faint companions

IV. Relative brightness of close double stars. On nights with passing clouds. Compare components of Struve's Catalogue brighter than 5.0 m. with Phot. C. This may also be done on good nights with W. Equat. or Comet Seeker

V. Comparison stars of fainter variable stars. On nights when air is uniformly clear even if seeing is not particularly good. W. Equatorial may also be used for this purpose.

VI. Comparison stars of brighter variables. Zöllner Photometer.

D Wide, unequal double stars;

		Mags.	Angle	Dist.	Remarks.
C	– δ Andromedae		298°.9	27″.88	Found with the 26-in. measured with 18½
C	– θ Ceti		60.5	58.6	Very faint
	γ Arietis				A minute star between AB and the distant comp. of Sh. (85°.2 : 228″.76 (1823.9))
	o Ceti		91.5	73.86	a and B } A very faint star between Mira and Herschel's comp = C
			82.8	115.16	a and C
	β Persei		154.8	59.17	a and B } D - Smyth's comp. All the others faint.
			144.2	67.64	a " C
			193.7	81.71	a " D
			114.6	10.47	D " E
C2	– 40 o² Eridani		145.7	37.02	mean of 3 obs. (1877.8) Discovered by Winnecke
1 2	– α Tauri	1	107.4	30.38	Very difficult
C2 2 2	o² 9 Orionis	5	47.7	28.45	
C1	– β "	1	1.5	44.32	Mitchel's companion
C1 1 2 1 2 2	τ "	4			Has 2 comps. The p one is double. B″
	δ "	2.2-2.7 var.	227.4	33.45	Very faint. This is nearer than the Struve comp.
	11 Monocerotis	4.5	57.3	25.49	A third star to the well-known triple
2 2	– Sirius –	1			Faint star in 115° and a brighter in 159°
2	Procyon	1	316.9	44.56	The old comp.
	β Geminorum		274.9	62.79	

Ret.	187~~6~~5	Dec.			
0	33	+30	11	111 D 28	J.12
1	18	−8	50	″	
1	47	+18	41	Not seen	
2	13	−3	33		
3	0	+40	28		
4	10	−7	49	P.S. P.S.	
4	29	+16	15	P	
4	49	+13	19	P.S. P	
5	9	−8	21	P.S.	
5	12	−6	59	P	
5	26	−0	24	Not seen	
6	23	−6	57		
6	40	−16	33		
7	33	+5	33		
7	16	+28	2		

D

		Mags.	Angle	Dist.	Remarks.
	σ Coronae	6.5	231.6	20.41	OΣ's faint comp., but discovered by H. OΣ calls it a severe test (1854) and says in a few years it will be impossible to see it. His measures given 1854. Holden, 226°.3 : 14".68 (1875.4)
	Vega	1	298.8	46.87	Discovered by Winnecke (A.N. 1738) Difficult.
	γ Lyrae. Ca. g. a ½ C?		90° or 270°	5"	
1	– β Aquilae	4	17.0	11.34	= O Σ 532
	γ Cygni	3.2	195.8	14.0	A & B }
			306.2	2.1	B & C }
C 3,!!	– β Delphini	3.4	117.2	27.65	Herschel's comp. (1871.8)
2	– ε Cygni	3.2	323.0	35.	
2	– γ Equulei	5.4	10.0	41.20	
	β Equulei	5	260.1	31.98	Nearer and fainter than H's companions.
	2 Pegasi	5.4	334.4	29.81	
C 2 ?	– β Aquarii	3	320.0	34.14	A & B } B = H's comp.
			185.6	54.85	A " C }
2 ?	μ – μ Cygni	4.5	262.7	35.28	
	α 7 Lacertae	4	299.0	30.	

1878phae.proj..4Y10

~~1870~~ 1875

R.A.		Dec.					
16	10	+34	10	Sn			
18	33	+38	40				
19	49	+6	6	P .774			
		+14	10	nov 13			
20	18	+39	51				
20	32	P 2.426		—	—	—	2.426
20	41	+33	30	D qk 1.500	P, S		
20	59	+5	28				
21	5	+6	15				
21	24	+23	6				
21	25	−6	7	n17d	n17d		
21	39	+28	11	D16 P 1.988	D16 S1 1.45		
22	26	+49	39				

Bright Variables

α Cass.	3	..	
ρ Persei	6) 10		
β "	8)	=	
λ Tauri	5	–	|||| P $\overset{3d}{P}$ M $\overset{3d}{M}$
ε Aurigae	4	..	|| M $\overset{8th}{M}$
α Orionis	5		
ζ Geminorum	5	–	|| M $\overset{9th}{M}$
α Hydrae	4		
α Herculis	5		
β Lyrae	10	=	
η Aquilae	6	–	|||| ~~||||~~ P^{1st} $\underbrace{\overset{2d}{P}\quad P}$ $\overset{8th}{P}$
Pleiades			
μ Cephei)			
δ ")	11	–	
β Pegasi	6		

W. Equat.	E. Equat. repeat.
α Ursae Min.	—
η Tauri	- -
β Orionis	—
δ "	—
α Canum Venat.	
ζ Ursae Maj	—
ζ Lyrae	—
η "	—
β Cygni	
β Cephei	
β Scorpionis	

Minima

		M.	H	
Dec 7	12.1	7.4	5.8	E
8	10.7	6.0	4.4	"
9	9.3	4.7	3.0	.
12	16.5	11.8	10.2	W
13	15.1	10.4	6.8	"
14	13.8	9.1	7.5	'
15	12.4 .7	7.7	6.1	.

Summary of A, B, C, D in order of RA

hours	A	B	C	~~D~~		D	C'	
0	9		6			1	5	𝍸
1	4		8			2	8	𝍸||
2	5		9			1	9	|
3	1		9			1	5	
4	4		7		—39	3	2	
5	8		15			3	14	
6	2		3			2	3	
7	4		5		34	1	4	
8	2		4				3	
9	1		2				2	
10	2		4				2	
11	5		8		—		3	
12	2		7				5	
13	2		2		40		2	
14	3		5				4	
15	4		7				3	
16	2		7			1	4	
17	3		12		—		9	
18	7		11			1	8	𝍸
19	4		9			1	6	||||
20	7		8			4	5	|
21	4		6			4	5	|
22	4		3			1	3	
23	1		1				1	
							115	

Photometric References

Dawes Astron. Soc. Notices xi p. 187 limiting aperture
xii 80 referred to, contained comparisons with *

Smyth. " " " vi, 13, 324 Specula

Birt ii, 79 ? bright stars not published

Dunlop ii 190 Measured disks

Carrington.

Mason

Phot. M.

47,	29	albsan
	70	Error Rack
	109	Venus
	124	Planets
	134	Jupiter

Nova Cass. Nature Dec 13th 1877 xvii, 129

1572 A.D. Brahe

	RA		Dec	
κ Cass.	0h	26m 10.0	62°	17'
9m	0	17m 32.0	63°	37.4
10 Cass.	0	0m 22.0	63	32.
Nova.		18 21	63	28

Anthelm's Star xvi, 102 Nature, and xviii 281

Anthelm Star. 11 Vulpec. 1880

Anthelm (1670)	19h	42m 45.10	+27°	1' 28"	11.12m Gr [illegible]
		42 57.6 57.5	27	4'	" "
		43 10.1		3'	" "

· · *

Kepler's Star. 1870.0 Nova Ophiuchi

Kep. (1604) A.D.	17h 22m 57.0	-21	22.0
Chac. Star. 10m	43		22.5
Winnecke 12 m.	43		20.8
Argelander. 8.9	13 16		22.8
no van [illegible] 12m	22 57.		24.4

T Coronae (1870) 2.5 – 9.8
T. (1866.) 15 54 4 +26 17.5

4.5	15	43	31.0	26	31.5
9.1		52	25.4		24.2
9.5 Var.		53	26.9		20.1

Nova Ophiuchi 4.5 – 13.5 Hind.
(1848) 16 52 13 −16 53.1

Cygnus 1876. Nature xvi, 400
DM 42° 4184, 9.1
" " 4185.
21 36 52.5 42° 16′ 54″

γ Pegasi * mean 0h 5m 41.80 +16° 7′ 4″ (1855) Nature Aug 15/78 xviii, 428

Additional Double Stars for C
from Webb's

			Mag.	Ang.	Dist.
π Andromedae	0h 30'	33° 0'	45 – 9	174	36
ε Arietis	2 52	20° 49'			

Oberon.	S	S	N	N	N
	2	6	4	2	2
Titania	N	S	N	S	S
	2	6	6	4	4.
Ariel?	N	N			
	2	2			

Uranus Satellites

	Obj.	Obs.	N.S.
Oct 3d.	R	P	N
	U	"	"
7th	R	"	S
	U	"	"
	U	U	"
	R	"	"
			"
			"

Subdivision of above researches.

I Clear Cold Nights.

Catalogue E. Additions to C.

								°	″
C 44	π Andromedae	0	30	+33	0	4.5	9	174	36
	d ε Arietis	~~1~~ 2	52	+20	49	5	6.5	200	1
C4,4:2	ω Fornacis	2	28	−28	57	5	8	242	11
C,4,4?	θ Eridani	2	53	−40	50	5	6	81	9
	12 "	3	7	−29	30	3	8	310	~~8~~ 5
C4,4,4	f "	3	44	−38	1	5	5	200	9
C2,4,4	39 "	4	8	−10	35	5	11	154	7
	~~d τ Tauri~~	~~4~~	~~34~~	~~+22~~	~~42~~	~~3.5~~	~~10~~	~~210~~	~~62~~
	d η Orionis	5	18	−2	31	4	5	87	1
	d 32 "	5	24	+5	51	5	7	206	1
~~4~~	~~26 Aurigae~~	5	30	+30	25	5	8	268	12
~~2~~	~~κ Puppis~~	7	34	−26	29	5	5	138	10
	κ Geminorum	7	37	+24	41	4	10	232	6
	ι Ursae Majoris ~~φ Virginis~~	8	50	+48	33	3.5	13	348	12
	~~d~~ β Crateris	11	46	−33	11	5	5	240	~~3~~ 2
	φ Virginis	14	22	−1	39	5	13	115	5
	44 Bootis	15	0	+48	10	5	6	240	5
	d γ Lupi	15	26	−40	44	4	4	94	~~75~~ 1
	α Serpentis	15	38	+6	48	2.5	15	1°	50
	~~β "~~	~~15~~	~~40~~	~~+15~~	~~50~~	~~3.5~~	~~10~~	~~264~~	~~30~~ 31
	η Lupi	15	51	−38	2	4	8	22	15
	d ξ Scorpii	15	57	−11	1	4.5	5	13? 170°	1
	ν "	16	4	−19	7	4	7	338	40
	σ "	16	13	−25	17	4	9.5	272	30
	d. ν_2 Coronae	16	18	+34	0	5	12	[illegible]	137
	36 Ophiuchi	17	7	−26	24	4.5	6.5	226	5
	5827 B.A.C.	17	10	−24	9	5	6	358	15
	21 Sagittarii	18	5	−20	37	5	9	287	2
	μ "	17	57	−21	5	3.5	9.5 10	315 114	40′ ?40″ 45″

P P P S P S
J. 13d J 16

P S P S
~~J 18~~
P ½

Out mit Rum!

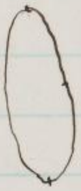
P, P, S S

PP

	h	m	°	'	Mag.		Ang.	Dist
~~40, 41 Draconis~~	~~18~~	~~10~~	~~+79~~	~~59~~	~~5.5~~	~~6~~	~~235~~	~~20~~
110 Herculis.	18	40	+20	26	5	16	110°	55
~~ζ Sagittae~~	~~19~~	~~43~~	~~+18~~	~~49~~	~~5~~	~~9~~	~~312~~	~~9~~
~~π Capricorni~~	~~20~~	~~21~~			~~5~~	~~9~~		4
ρ Capricorni	20	22	−18	14	5	10	177	2
β Piscis Australis	22	24	−33	1	4	8	173	29
γ "	22	45	−33	33	4	10	277	4
π Cephei	23	4	+74	41	5	10	?	1
~~χ Cygni~~	~~19~~	~~40~~	~~+33~~		~~5~~	~~9~~	~~73~~	~~26~~
							Distance.	Angle
β Eridani ~~61 Cygni~~	5	0	−5		3	12	120	147
83 Leonis ~~β Eridani~~	11	20	+3	42	6.3	7.3	30	150
κ Bootis	14	9	+52	23	5.0	7.0	13	238
ν Coronae /	15	37	+26	42	4.0	7.0	1	111
β Serpentis	15	40	+15	47	3.0	9.2	31	265
σ Coronae	16	10	+34	12	5.0	6.1	1	89
$\nu^1 \nu^2$ "	16	18	+34	2	4.8	5.1	372	166
59 Serpentis	18	21	+0	6	5.0	8.0	4	314
17 χ Cygni	19	44	+33	28	5.0	7.0	26	73
ζ Sagittae	19	43	+18	50	4.3	9.0	8	313
61 Cygni	21	1	+38	6	5.0	6.0	15	89
γ Leporis	5	39	−22	30	4	6.5	93	349
~~"~~	~~5~~	~~6~~	~~−14~~	~~2~~	~~4.5~~	~~12.~~	~~15~~	~~337~~
~~* "~~	~~5~~	~~7~~	~~13~~					
88 Tauri	4	29	+9	54 (1870)				
τ "	4	34						
ε Gemin.	6	36						

Uranus. mar & Lassell

	Min Semi ax.	Maj. S. Ax.	Periods	
Ariel	4.″58	15.2	2 12.5	2.52
Umbriel	6.3	21.1	4 3.5	4.15
Titania	10.3	34.7	8 16.9	8.70
Oberon	13.7	46.4	13 11.6	13.46



8° and 188°
Angles decimals

Neptune. C.M.T. 5.877

	N 40°	S 220°
Feb	5.21	8.17
	11.08	14.04
	16.96	19.92

~~G.M.T.~~ C.M.T.

	Ariel S	S			Umbriel N
Mar.	1.83	1.63		Mar.	3.13
	4.35	4.15			7.28
	6.87	6.67	7.93		11.43
	9.39	9.19	10.45		15.58
	11.91	11.71	12.97		19.73
	14.43	14.23			23.88
	16.95	16.75			28.03
	19.47	19.27		Apr.	1.18
	21.99	21.79			5.33
	24.51	24.31			9.48
	27.03	26.83			13.63

	Titania			Oberon	
	N = 8°	S = 188°		N = 8°	S = 188°
Feb.	2d 21h	Feb 7d 5h	Feb.	~~3d 10h~~	3d 10h
	11 13	15 21	"	10d 4h	16d 21
	20 6	24 10	"	23 15h	Mar. 1st 8
	28 23				
	8°	188°		8°	188°
Feb.	2.87	7.21	Feb.		3.42
	11.54	15.87		10.47	16.87
	20.25	24.42		23.62	Mar. 2.33
	28.96				
	N C. M 1.	S 188°		N 8°	S 188°
March	5.4	1.0	Mar.	8.8	Mar. 7.1
	14.1 8.7	9.7		13.4 22.2	15.5
	22.8 8.7	18.4	Apr.	4.7	29.0 13.5
	31.5 8.7	27.1		18.2	11.5
Apr.	9.2	4.8			
See page 98		13.5 8.7	Oberon		S S N N N
			Titania		N S N S S
		13.5			24.9
	17.9	22.2	May	1.6	May 8.4
	26.6	30.9	"	15.0	21.8
May	5.3	9.6	"	28.5	June 4.3
	14.0	18.3			
	22.7	27.0			

Observations Curtailed by Clouds

	P	S	U
1	June 3d.	June 15th	June 5th
2	" 7th	" 22d	" 13th
3	" 13th	" 30th	20th
4	" 21st		26th
5	" 26th		[illegible]

Curtailed. by ~~Dark~~ light.

	P	S	U
1	May 22d	May 22d	May 22d
2	June 3d.	" 27th	June 3d.
3	" 5th	June 5th.	" 5th
4	" 13th	" 13th	" 13th
5	" 20th	" 20th	" 20th
6	29th	" 29th	July 1st
7	1st–) July 1st)	July 1st	" 2d
8	" 3d	" 2d	" 3d
9	" 4th	" 3d	" 4th
10	" 5th	" 4th	" 5th

1	C	α Andromedae	1	11	65"		H	I	–
2		α Cassiopeae	3	10÷	97		H		--
3		α Tauri	1	12	108		H	I	–
4		β Eridani	3	12	120			I	
		α Aurigae	~~1~~	~~12~~	~~165~~	d			
5		β Orionis	1	8	9		H		--
		α "	~~1~~	~~11~~	~~160~~				
		α Can Maj.	~~1~~	~~10~~	~~150~~	d	H	I	–
		β Can. Min	3	12	35				
		" " "	"	10	105				
6		α Geminorum.	2	11	73		H		-.
		α Can Minoris.	~~1~~	~~8~~	~~145~~	d			
7.		β Ursa Majoris	2	11	75				
8		β Serpentis	3	10	31		H		
		η "	4	13	111		H		
9	C	α Lyrae	1	11	43		H	I	–
		α Aquilae	~~1~~	~~10~~	~~153~~	d		R	..
10	C	β Delphini.	4	12	30		H	I	--
11		α Cygni	1	12	108				
12		α Ursae Min.	1	9			H		..
		α Leonis							..

Copy of Stars on Pp. 70-71 to 18h.

								Dist.	Ang.
244 C	δ Serpentis	15	29	+10	57	3.0	4.0	3	197
444 C	ζ Coronae	15	35	+37	1	4.1	5.0	6	301
4.4.2	α Serpentis f	15	38	+6	48	2.5	15	50	1
4.2.2 2 C	β ″	15	40	+15	47	3.0	9.2	31	265
4.2.2 2	η Lupi	15	51	−38	2	4	8	15	22
4.4 2 C	β Scorpionis	15	58	−19	27	2.0	4.0	13	24
2.4.4 C	κ Herculis	16	2	+17	23	5.0	6.0	31	10
4.2 4 C	ν Scorpionis	16	4	−19	7	4	7	40	338
	~~σ Coronae~~	~~16~~	~~10~~	~~+34~~	~~12~~	~~5.0~~	~~6.1~~	~~1~~	~~89~~
4.4.2 C	σ Scorpionis	16	13	−25	17	4	9.5	20 ~~30~~	242
	~~ν¹ ν² Coronae~~	~~16~~	~~18~~	~~+34~~	~~2~~	~~4.8~~	~~5.1~~	~~372~~	~~166~~
~~#~~	ν² Coronae f	16	18	+34	0	5	12	137	18
4 4 2	16, 17 Draconis	16	33	+53	11	5.0	5.0	90?	15
4 4 2	17 ″	16	33	+53	9	5.0	6.0	4	116
1.2.4.	42 Herculis f	16	35	+49	10	4.0	10.7	22	92
4 4 2 C	43 ″	16	40	+8	48	5.0	9.0	—	230
4 4 2 C	μ Draconis	17	3	+54	38	5.0	5.1	3	205
4.4 2	36 Ophiuchi	17	7	−26	24	4.5	6.5	5	226
4 4 2 C	α Herculis	17	9	+14	32	3.0	6.1	5	118
4 4 2 C	5827 B.A.C.	17	10	−24	9	5	6	15	358
4.4 2 C	δ Herculis	17	10	+24	59	3.0	8.1	26	174
4.4 2 C	ν Serpentis	17	14	−12	43	4.0	8.5	...	...
4 4 2 C	ρ Herculis	17	19	+37	18	4.0	5.1	4	307
4.4.2 C	ν¹ ν² Draconis	17	30	+55	16	4.6	4.6	62	313
44 C	μ Herculis	17	42	+27	49	3.8	9.5	30	241
4.4 2	ψ Draconis	17	45	+72	13	4.0	5.2	31	15
4.4 2 C	67 Ophiuchi	17	54	+2	56	4.0	8.0	...	143
4 2 4	95 Herculis	17	56	+21	35	4.9	4.9	6	262

P.U.S.U P.S P
S.P. U.S P
tt P.S P.S U
U.S. S.P. P
P.S S.U P care
P P.S.U
triple * P.S, U P U

P.S. P.S U

S P U.S P
P.S U.S P
U. S. S. P.
wide. P.S. S U P
P.S P.S U
U.S. P.S. P
~~P.S. S.U. P~~
P.S U.S P
~~P.S. S P U.~~
wide P.S U.P S 30" 30°
U.S. P.S ~~S~~ P
~~P.S P.S U.S~~
P P.S U.S
S.U.S P. P
P.S. P.S U ΔRA. 2.20
U.P. P, P.S

			R.A.		Dec		Mags.		Dist.	Ang.
4.42										
4.42	μ Sagittarii	A	17	57	−21	5	3.5	10 9.5	45 (~~40'~~ 3'40")	114 315
3.44	70 P Ophiuchi		17	59	+2	33	4.1	6.1	4	148.4

P, S P U S
P, S P U, S
P, S½ U, P P, S

μ Bootis 15 20 37 45 4.0 6.7 7.3 108 1 172 327

Stars unfinished March 19, 1878

between 18 & 24 hours

							mags.		Ang	Dist.
2	21 Sagittarii		18	5	−20	37	5	9	287	2
2,4,4	η Serpentis	†	18	14	−2	55	3.3	12.0	77	113
4 4	59 "		18	21	+0	6	5.0	8.0	314	4
4,2,4 4,2,4	39 Draconis & Anon.		18	22	+58	45	4.7	7.1	22	89
2,4,4	116 Herculis	†	18	40	+20	26	5	16	110	55
—	β Lyrae		18	45	+33	13	3.0	6.7	150	46
4 2 4	θ Serpentis		18	50	+4	1	4.0	4.2	104	22
4 2 4	ε Sagittae		19	32	+16	11	4.7	7.7	81	92
~~not seen~~	~~δ Cygni~~		~~19~~	~~41~~	~~+44~~	~~50~~	~~3.0~~	~~7.9~~	~~38~~	~~2~~
2,4,2 2	17 χ Cygni		19	41	+33	28	5.0	7.0	73	26
4,2,4	ζ Sagittae		19	43	+18	50	4.3	9.0	313	8
	~~α Aquilae~~		~~19~~	~~45~~	~~+8~~	~~32~~	~~1.5~~	~~10.2~~	~~322~~	~~152~~
4 2 4	o² Cygni & P. XX. 63		20	10	+46	22	3.7	6.5	174	107
4 2 4	61 Cygni		21	1	+38	6	5.0	6.0	89	15
2	β Piscis Austr.		22	24	−33	1	4	8	173	29
	~~γ " "~~		~~22~~	~~45~~	~~−33~~	~~33~~	~~4~~	~~10~~	~~277~~	~~4~~
	~~π Cephei~~		~~23~~	~~4~~	~~+74~~	~~44~~	~~5~~	~~10~~	~~?~~	~~1~~
2,4,4	μ Bootis		15	20	37	45.	4.0	6.7 7.3	108 1	172° 327°
4,4 2	ν Coronae		16	18	34	0	5	12	18°	137″
1,2,4,3	242 Herculis		16	35	49	10	4.0	10.7	90°	22″

Obs.	1st	7th	14th	16th	20th				Ang 3d
0	9	18	6	5	5	4	3	2	2
1	13	10	8	4	3	1	3	2	1
2	11	10	11	9	2	3	2	3	1
	33	38	24	18	19			4	
			15		7				

9 13 11 33

18 10 10 38

5 8 11 24

seen no-Mars. July 30d. U
easily seen P, P.S P.S

U July 8th not seen July 31

P.S S.P. PS

uB {S. u. P S P
ac {S. u. P S P
~~ad~~ P, P.S. P.S.

{n S. P
P.S.
P.S
P,S

P.U. P S P
U.S, P. P.S

P. P.S, S. P P
U.S. P.S.P

S U P P.S
U P, P S P
P

P S P P S
P,S, P, ~~½~~ S P
(½U), S. ~~P~~ S P. P, (S ½) S

Faint Stars remaining to be observed Jan 10th 78 :

		(1880.)				Magn.		Dist.	Angle
2,2,1	ζ. Cancri	8	37.9	+18°	36′			46	121
—	41 Sextantis	10	44.3	−8	16			27	304
2,2,1	δ. Leonis	11	5	+21	~~3~~	3	13 [9]	Diff R.a. s 4.9	50
	β. Leonis	11	42.9	+15	15			7.6	344
	o Virginis	12	8.1	−5	3			25± 60±	335± 205±
2,2,2	ε "	12	54	+12		3½	Blue 15	229	124
2,2,1	α "	13	16	−10		1	10	ΔR.a. s 19.4	57
1,2,2	α Bootis	14	8	+20		1	11	ΔR.A. s 15.1	49
1 2 2	ρ "	14	26.7	+30	54			60±	333
	γ "	14	27.2	+38	55			26	99
2 2 1	α Serpentis	15	36	+6		2½	15	50	1½
	σ Coronae	16	10.2	+34	10.			16	222
	η Draconis	16	22	+62		3	11	190	31
	η Herculis	16	38.8	+39	9			141″ . . . 100″ ~~265~~	265° . . . 265° ~~141~~

B

B

B

u P, P,S, P,S

P,S,, P,S P

P, P,S, P,S

B P,S, P, P,S

B not seen July 21 P.
July 24 P,S
Suspected Aug 2d P.S

P,S, S

B not seen Aug 2d

B

							Mags		D.	P
		γ Draconis	17	53.8	+51	30			21"	152
										123
2		μ Sagittarii	18	6.6	−21	5	3½	16	~~260~~ 10	~~10~~ 260
								9½	40	315
								10	~~45~~	114
							(Burnham)		~~51~~	~~115~~
									50	? 25 115°
1 2 2		η Serpentis	18	13	−3		4	13	111	44
1		110 Herculis	18	40	+20	26	5	16	55"	110°

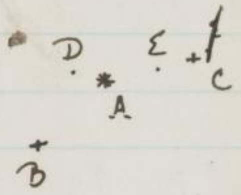
	July 14th	July 20	22	
0	7	7	5	3
1	2	1	2	2
2	2	1	2	
	9	8	7	

		42 Herculis								
		β Delphini								
		δ Equulei.								
4.34	H	σ Coronae	16	10	34	10				
4.24	H									
4		η Draconis	16	22	62		3	11	90"	31°
		η Herculis	16	39	39	9			140"	265°
									100"	"
2	H	21 Sagittarii	18	5	−20	37	5	9	2	287

B

0

~~P, S~~
~~P, S~~ * too bright to be measured July 21
~~P S~~
" " " "



B

P, P, S, S, P

P

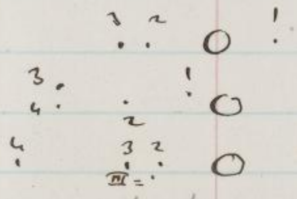
P, S. P, S, S P
P, S, P, S
P, S

u

Eclipses of Jupiter's Satellites visible at Cambridge 1878.

+			June	9 13	15	44 ~~43~~	I	D	
+			"	16	11	56	III	R	cl.
			"	22	12	7	I	D	cl
+	I	P.S	"	23	12	33	III	D	Obs. Phot I P. 18 S mi.
	II	P.S		29	14	1	I	D	P 8 P mi.
+	III	S.P	"	30	12	49	II	D	S 15 P mi.
			July	6	15	55	I	D	Hazy at 11 cloudy at 17
+	IV	P.S	"	7	15	24	II	D	II = 39" III = 90"
			"	8	10	24	I	D	Time supposed to be Washington; err
	V	S.P.	"	15	12	18	I	D	Obs. Phot I S. 3
			"	22	13	13	I	D	not obs. cloudy at intervals two more affected
			"	29	11	58	III	R	Cloudy
			"	31	12	52	I	R	Cloudy at 11 30, and 20 h
			Aug.	1	15	15	II	R	Cloudy at 14.50, and 20
	VI	P S	"	7	14	47	I	R	Obs. Phot I P.
			"	9	9	16	I	R	Raining fast
				12	7	10	II	R	clouded, too light
			"	15	12	2	IV	D	Cloudy at 11 30 Clear 11 45
			"	16	11	11	I	R	
	VII	P	"	19	9	44	II	R	
	VIII	S	"	23	13	6	I	R	S
+	IX	S		~~25~~	7	34	I	R	S
	~~X~~	S	"	26	12	20	II	R.	S
+	XI	P	Sept.	1st	9	30	I	R	P
+	XII	P	"	"	10	39	IV	R	P
			"	3	8	23	III	R	Clouds
+	XIII	S	"	8	11	26	I	R	
	XIV	**	"	10	8	34	III	D	
	XV, XVI		"	"	12	4	III	R	

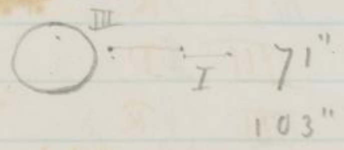
1878phae.proj.



error not discovered in season for observation,

30" − 23 = 7"

fr. Cent.	from Limb.
26	4
34	12
42	20
36	14
37	15
46	24
39	17
110	88
66	44
41	19
29	8
71	50



7 5-6 III Oc Re.

Shadow of
Transits of Jupiter's Satellites.

at Cambridge 1878
Cambridge Mean Time

July	~~15~~	14 ~~59~~		~~I~~	I	
	16	9	23	I	I	
		11	47	″	E	
		12	49	II	I	
		15	44	″	E	
	18	14	27	III	I	
	21	9	44	IV	I	
		14	25	″		
	23	11	21	I	I	
		13	41	″		
		15	26	II	I	
	30	13	16	I	I	
		15	27	″		
Aug.	1	10 ~~9~~	14 ~~53~~	″	E	
	3	10	19	II	E	
	6	15	10	I	I	
	7	8	27	IV	E	[illegible]
	8	9	39	I	I	
		11	59	″		
	10	10	0	II	I	
		12	56	″	.	
	15	11	34	I	I	
		13	21	″	.	
	16	10	4	III	E	
	17	8	22	I	E	
		12	37	II	I	
	22	13	49	I	I	
	23	10	27	III	I	

	Aug 31st:	9	0	I	Tr	In.
		9	52	I	Sh	In.
	Sept. 2d	10	14	II	Oc.	Dis. S.U.
—	4th	10	7	II	Sh.	Eg.
"	7th	10	47	I	Tr	In
"	9th	8 7	7 34	II I	Oc "	Eg.
—		8	2	I	Sh	Eg
—	10th	7	56	III	Oc.	Re.
	15th	9	57	I	Oc	Dis
	16th 4	9	24	I	Tr.	Eg
		10	31	I	Sh	Eg.
	18.	10	8	II	Tr.	In.
	23	8	54	I	Tr.	In.
	25	6	55	I	Sh	Eg
	28	6	32	III	Sh.	In
		10	11	"	"	Eg
	29	7	18	II	"	Eg.

Minima of β Lyrae.

.85 =   .2 = 5h   .5 = 12.0

days and tenths.
6.2   4 P.S
July 9.6 m ±.4 = 9h 1 S
13.8 ±1.1 26h 2 P.S
16.0 ±.6 14h 3 P.S
19.2 ±1.1 26h 4
22.5 m 1 P
25.7 2
28.9 3
1.1 4
Aug. 4.4 m 1
7.7 2 P.S.
10.8 3
14.0 4 P.S.
17.3 m 1
20.5 2
23.8 3
27.1 4 u
30.4 m 1 P.u
Sept: 2.5 ~~2 u~~   u
5.6 3
~~8.9~~
Sept. 12.2 m 1
15.4 ~~2~~   u
~~18.6~~ ~~3~~
~~22.0~~
25.3 m 1 S
Oct. ~~1.6~~ ~~3~~   v
Oct. 8.2 1
~~14.8~~ ~~3~~

m 1 (9S) P., PU. S
2 (11PS) P.S. U
3 (16PS), US, P
4 (6PS), PS, U

Sept. 25

Jupiter

I II ~~P~~
" III P.S,
" IV P, PS,
II, III
" IV ~~P.P.~~P, S,
III, IV.

Minima of Algol

		C.M.T.		
July	27th	15	21	
	30th	12	10	
Aug.	2d	8	58	hazy in N.E. later cloudy
	5th	5	47	
	19th	13	49	
	22	10	38	
	25	7	26	
	28	4	15	
Sept.	11	12	18	
	14	9	6	
	17	5	55	
Oct.	1	13	58	
	4	10	46	
	7	7	35	
	10	4	24	
	24	12	26	
	27	9	16	
	30	6	5	

Minima of Algol.

	P.M.T.		C.M.T.	
	h.	m.	h.	m.
Nov. 2	7.	48	2	54
13	19	3	14	9
16	15	52	10	58
19	12	41	7	47
22	9	30	4	36
25	6	19	1	25
Dec. 6	17	35	12	41
9	14	24	9	·30
12	11	13	6	39
15	8	2	3	8
26	19	18	14	24
29	76	7	71	13

$\frac{2}{5}$

Minima of S Cancri

	P.M.T.		C.M.T.	
	h.	m.	h.	m.
Nov. 9	10	21	5	27
18	21	57	17	3
28	9	34	4	40
Dec. 7	21	11	16	17
17	8	47	3	53
26	.20	24	15	30

Tests of Phot- II

λ 2 images at	60"	P	S	U
	20"	P	S	U
	10"	P	S	U
	5"	P	S	U
	3"	P	S	U
51 Ceph.	|	P	S	U
	\	P	S	U
	—	P	S	U
	/	P	S	U
λ Ursae	|	P	S	U
	\	P	S	U
	—	P	S	U
	/	P	S	U
	|	P	S	U
	\	P	S	U
	—	P	S	U
	/	P	S	U
+89°.3 9m	|	P	S	U
	\	P	S	U
	—	P	S	U
	/	P	S	U
Focus within		P	S	U
little "		P	S	U
exact		P	S	U
little without		P	S	U
without		P	S	U
Focus on A		U	S	
" " B		U	S	

~~λ Ursae min~~

α Lyrae compare pr. stars near A with B P. U.

η Draconis " " dist. A " "

Limit-Visibility

51 Cephei Both images P.S U U
λ Ursae Min. " P.S. U U
~~β~~ DM +89° 3 " P.S U U
α Urs. Min. P.S U U
1 α Lyrae S½ U image did not disappear
2 α Ursae Min U S U
3 α Andromedae U U
~~4 39 Draconis~~
7 ζ Ursae Majoris U
~~8 β Scorpionis~~
9 α Canum Venat.
10 β Cygni
5 ε Draconis U +
~~8 α Lyrae~~
~~6 ψ Cygni~~
6 ε Bootis U

Ap. 5"

ζ Ursae Maj 2.1 4.2 14 ~~[illegible]~~
~~β Scorp 2.0 4.0 13~~
α Canum Venat. 3.2 5.7 20
β Cygni 3.0 5.3 34
η Lyrae 4.0 8.1 28

W. Equat.

ζ Ursae Maj
~~β Scorp~~
α Can Venat
β Cygni
η Lyrae

Comp II and I.
I ap 5"

α Lyrae
α Ursae Minoris
α Andromedae
α Cassiopeae

1st May.

α Can Maj.
· α Lyrae
β Orionis
α Aurigae
g α Bootis
α Can Min.
α Virginis
α Tauri.

· α Aquilae.
· α Pis Aust.
α Leonis
g α Scorpii
β Gemin.

Phot.-H

β Pisc Aust. P,
~~γ Pis Aus.~~
~~σ² Coronae A.B.~~ C
~~" " A.C.~~ C
21 Sagitt.
η Drac.? 2 U
β Lyrae
~~λ Ursae Min. Effect dist. image.~~
51 Ceph. ~~Effect foc. image~~ P S U
λ Ursae " " " P.S U
" " " " " P S U
9m " " " P S U
P.S.U
Effect Focus
Limit Visib. λ P S U U
" " 51 P S U U
" " 9m P S U U
" " α

N. Equatorial

							Ang	Dist
~~? η Tauri~~	~~3~~	~~40~~	~~23~~	~~44~~	~~3.8~~	~~7.0~~	~~289~~	~~117~~
~~ε Geminorum~~	~~6~~	~~36~~	~~25~~	~~15~~	~~3~~	~~9.5~~	~~94~~	~~11~~
~~γ Leporis.~~	~~5~~	~~39~~	~~22~~	~~29~~	~~4~~	~~6.5~~	~~349~~	~~93~~
11.12 Camel.	4	55	58	49	5.0	6.0	7	181
> α Librae	14	44	−15	30	3	6	314	229
ε5 Lyrae	18	40	39	30	4.6	4.9	173	207
~~o¹o² Cygni.~~	~~20~~	~~10~~	~~46~~	~~22~~	~~3.7~~	~~5.0~~	174	107
β Capric.	20	14	−15	11	2.5	6.0	267	205
ε Pegasi	21	38	+9	17	2.5	9	324	138

> α Can Venat.
ζ Ursae Maj.
β Cygni
η Lyrae

Contact by Hale R.S.
Sept 6. | P.S.U
" 9 P.S.

Sheet I

~~η Drac.~~ ~~U U~~

C η Herculis B S U P U P 265° 140"
C S U P U 270° 100"

γ Drac. not seen Aug 27th.

C μ Sagitt. P (too br. P.S. Aug 20th (too bright Aug 23 S. U.)

C 110 Herculis P, P, S S U

α Ursae Min. 15", 5" 5" S U {15" S, u PS
{5 S u

C α Lyrae 15" S U {15 S uS (P too br. P
{5 uS, uS, P, PS, P C

C α Andromedae U S U {~~15 u, P, PS~~
C ~~{5 u, P, S P S~~

C α Cass {15 too br.
{5 P, PS, SU

Japetus

Mimas

Neptune's satel.

Constant I by obs. Jupiter

~~61 Herculis~~ 5"? too br.

~~β Delphini~~ PS

~~δ Equulei~~ US

C ~~α Lyrae 15"~~ SuSP. ~~PUS~~

C η Herculis B 265° 140 Su, uPP

C " " C 270° 100 Su, uPP

α Ursae Min. 15" Su, PS

" " 5" Su

γ Draconis

8h [illegible] D 250° 150"

West Equatorial.

Photometer H.

› α Canum Venaticorum – U P, S P. U
› ζ Ursae Majoris – P U P S U
β Cygni U P P S
η Lyrae – U P U P S
ε " P U P S
• 11.12 Camelop. – P, P S S U U
› β Cassiae U P S P S
C • ε Pegasi – U U P P S

ζ Leonis S (U:) P ½. S P.
17 Comae Berenicis P U.

Hyperion

90°	270°
Oct 13	~~Sept 27~~
~~Nov 3~~	23
Nov 3	Nov. 13

	Interval Transit
Elong.	16 l
1 day	15
2	12
3	10
4	5
5	0

S P ~~P~~ —
~~P~~ P S —
P S U —
P ~~S~~ U —

Content by R.3.

P	S	U	P	S	U
Sept-6	Sept 6	Sept 6 ~~86~~	1.084	1.412	.686
9	9	9	1.202	1.480	1.420
Oct 3	Oct 3	Oct 10	1.720	1.966	1.454
4	4	" 14	1.836	1.994	1300
10	10	" 15	1.314	1.580	
13	13	" 16	1.816	1.510	
14	15 ~~16~~	" 17	1.526		
15	16	18			
16	17				
17	20				

XVI

Eclipses Jupiter Satellites 1878.

Sept.	13,	6,	51'.	II	R	no.?		clouds	
	17.	7	50	I					
		~~12~~	~~35~~	~~III~~	~~D~~	~~?~~			
	20 17	9 9	28 21	II	D Be				
	24	9	45	I					
	~~27~~	~~12~~	~~5~~	~~II~~		~~?~~			
Oct	~~1~~	~~11~~	~~40~~	~~I~~		~~?~~			
	3	6	9	I		Σ, S, W		P	21 22,
	10	8	5	I		P		S	23 24
	15	6	38	II		S		P	25
	16	4	39	III	Dis	clouds			
	16	8	16	III	Reap	P		S	26 27
	17	10	0	I		S?		P	28 29
	19	4	28	I	?				
	22	9	16	II					30
	23	8	40	III	D			cloud	
	26	6	24	I		?			
Nov.	2	8	19	I					
	7	6	45	IV	D				35 36.
	9 ?	10	13	I ?		?			
	14	4	44	I					
	16	6	28	II					
	18	6	39	I					
	23	~~9~~	~~5~~	~~II~~ ?		~~?~~	~~[illegible] ?~~	lit	
	24	5	36	IV		?			
	25	8	34	I		?			
	28	4	45	III	D	?			
	"	8	17	"					
Dec.	4	4	58	I		?			
	~~5~~	~~8~~	~~45~~	~~III~~		?			
	11	6	53	I					
	18	6	20	II					
		~~8~~	~~47~~	~~I~~		?			
	27	5	1	I		?			

	″ fm edge
53	32
42	21
—	
55	35
42	22
42	22
42	22
42	23
56	37
76	57
41	12
54	36
38	20
40	22
39	21
72	54
37	20
48	31
36	19
95	78
34	17
26	9
59	42
32	15
32	16
36	20
26	10

3d O.L $\overset{150}{\underset{1.5}{135''}}$ 15

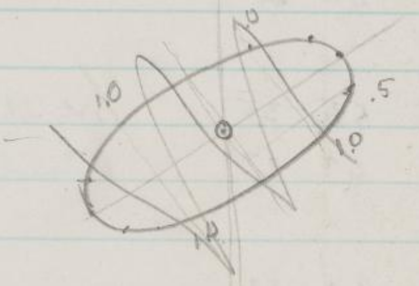
Cloudy. Jupiter came out 4 O.L. later.

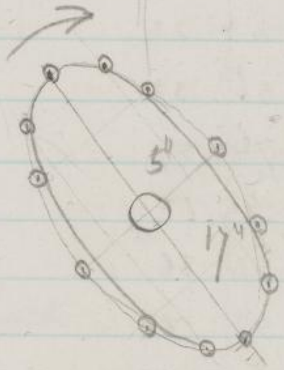
Satellite of Neptune

Semi Axes 16".7 5".9 221°.6 and 41°.6 angles distance

	222°			42°	
Aug	16th.	3		19,	2
	22	0		24,	23
	27	21		30,	20
Sept.	2	18	Sept.	5,	17
	8	15		11,	14
	14	12		17,	11
	20	9		23	8. Pk.
	26	6		29	5
Oct.	2	3	Oct.	5	2
220°	8	0	40°	10	23
	13	21		16	20
	19	18		22	17
	25	15			
	31	12		28	14
			Nov.	3	12
Nov.	6	10	"	9	9
	12	7	"	15	6
	18	4	"	21	3

17"





Japetus w. elong. Aug 14th, Conj. S Sept 2 E. elong. Sept. 21.
60.3 eq. semidia 9.4 eq. semidia
.65 390 = max. dist.

Hyperion. Heli. Lat. 0 ~~[illegible]~~° 39" Aug 15 0°.09 Sept. 5 0°.405, 26 0°.716 Oct. 18 0°.028
angle. direction max = 240" = 160 Nov. 8 0°.339

Mimas.

	W.G.h.1	C.h.1.	
Aug 28	21.5		
29	20.1		
30	18.7	14.0	
31	17.3	12.6	
Sept. 1	15.9	11.2	
2	9.8		
3	8.4		
4	7.0		
1.			
17	11.8	W	En W.
18	10.4	"	
19	9.0	"	
20	7.6	"	En W.
21	6.2	"	
22	4.8	"	
25	12.0	E	
26	10.6	"	
27	9.2	"	
28	7.8	"	
29	6.4	"	
30	5.0	"	
27	7.6		
28	6.2		

ΔRA

160 -1.9 Sept. 8 190.
" 12 280.
" 15 340.
170 -1.9 " 21 390
26
Oct. 1 28.
Oct 11 0

Japetus.

Aug 14	P.S.U	
29th.	P.U.	
31st	P	
Sept. 1st	P	
" 6	P.S.U	
" 7	PS	15.
8	PS	18.55
9	SPU	21
14	SP	33
15	SP	34
16	SAB	
17	SPU	36
18	SPU	
27		34

28
36
40.5

Hyperion.	50
Mimas.	50
Japetus	100
Neptune's Sat.	50
Contact Jupiter.	150

Colored Stars.
New Stars.

East Equatorial. Phot—H

C limit vis. +89°3 P, S, U, U P
C λ P S U U P
C 51 P S U U P
C α P S U U P
C Ursæ α U S P U
C " β U S P U

ζ Bootis De 1" 64
γ Coronae
ξ Scorp. —
σ Coronae 3"
λ Oph. 1½ —
ζ Her. —
τ Ophiuchi —

~~α Lyrae~~
+ — α Ursae Min. U S U, P U P
+ C α Androm. U U, P S P U
+ C α Cassiopeae P U, P U, P S.
C ~~39 Drac.~~
C ε Drac. U, P S, S ~~[illegible]~~ P
C ε Bootis U P, P U, S

C α Canum Venat. 15" P, U, ~~PU~~ S
C " " 5" P, U P U S
C ζ Ursae Maj. 15" U, P, U P S
C " " 5" P U, P U S
C β Cygni 15" P ~~SU~~ S U, P U
C " 5" P ~~X~~, S U, P S
C η Lyrae 15" P U, P ~~R~~ S U,
C ~~" " "~~ 5" P, P S, U S
C η Draconis P S, U, P½ P U
α Ursae Min. P 60, 40, 18, 10, 5 U 60, 40. 18, 10.
~~160 ρ Capricorni~~
C 174 β Piscis Australis P, P S, U S
β Lyrae
Jupiter Jr. P
Oc. U S.

is red.

tel α (β δ) γ Aquilae to be examined in telescope

tel. α Delphini — " —

~~ε Cygni — " —~~

tel ε Pegasi Sept. 23 D two bright

~~ζ Pegasi Sept 27~~

~~μ Drac. components equal~~

f¹ Cygni what pos. angle.

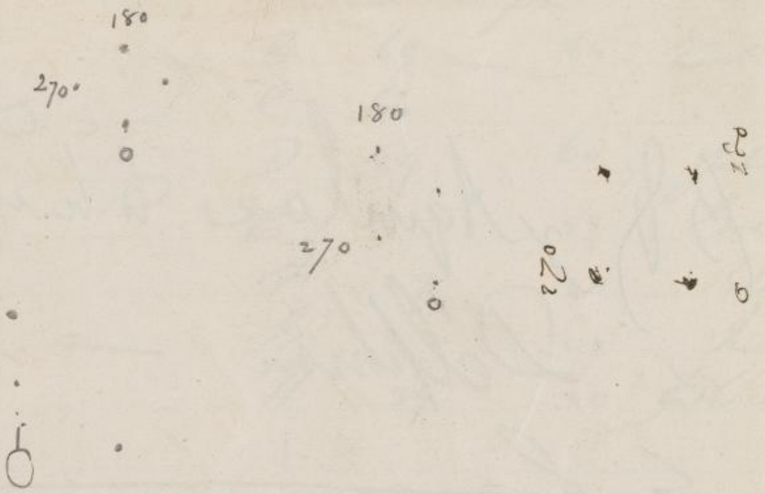
C 327° 8.5"
D 307 5.0"

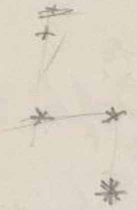
~~16 37 26° 42' ?~~

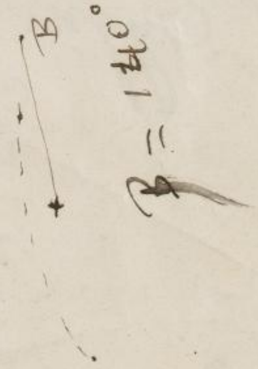
~~γ Coronae 3" 16h 10m 11s 34° 12'~~

~~σ " AB pu~~
~~AC pu~~

Wanted







γ Ariet.
ψ' Pisc.
δ Orionis, B; C.
ζ Aquarii
~

~~26° 42' ?~~
~~γ Coronae 3" 16h 10m 37 11s 34° 12'~~
~~σ " AB / Pu~~
~~AC Pu~~

1878phae.proj..47I0

Wanted

Wave Length.

B	.69	65	Extr. red.
C	.66		
D	59	60	Yellow
E	53	55	Green
F	49	50	Blue
G	43	.45	Indigo
H	39	.40	Extr. Violet

S
SP ~~P~~ UP.
~~S~~ ~~PU, PS.~~

Colored Stars.

β Cygni
γ Androm.
P, then S γ Castick
S β Lyrae (1) PUSP.
S C ~~" " (3) PS. SUP.~~
S α Ursae Min. U 60"
S " " " S 18"
S 3805 " " " 60
~~S~~ PSU, P " " " 40.
P PSU, " " " 18
SU " " " 10
" " " 5.
" " " 3

S Jupiter W. P
S " Oc. S
U

~~γ Coronae~~ 3" ~~16 37 26° 42' ?~~
~~16h 10m 11s 34° 12'~~
~~σ " AB PU~~
~~AC PU~~

Atmospheric Absorption.

α Ursae Minoris

β Cassiopeiae	2.5	0h	1	+58°	20
α Persei	2.5	3	14	49	20
δ Aurigae	3.5	5	47	54	16
o Ursae Maj.	4	8	18	61	13
β " "	2	10	53	57	11
η " "	3	13	18	55	43
β Draconis	2.5	17	37	52	25
α Cephei	3	21	15	61	57

α Geminorum	2 1
α Leonis	1
α Bootis	1
α Lyrae	1
α Andromedae	2
α Aurigae	1

γ Androm. D, DS,
β Cyg. DS.
η Cass.

Proposed Researches.

H. I. Jupiter's Satellites Eclipses. Ph. 127 142
I. Jupiter. 144
" Mimas Hyperion 145
" Neptune's Satellites 144
> " Faint Stars near Pole, in [illegible].
" New Stars. 96

K. Asteroids 152
> Clusters.
> Comp. Stars to Faint Variable.

> M. Bright Doubles
N Close Doubles
K Algol.

β Cygni P. S.
γ Androm. D. P. S.
η Cassiope.

α Lyrae. Mädler Star at 42° 139" believed to be variable. 1 mag. fainter than other
xviii 434

~~SU PS P α Ursae Min.~~ C

~~P.PS.SU α Arietis~~ .

~~PU~~ α Aurigae 150° 165"

~~P.US.U P μ Sagitt. C~~

P.

SU. α Lyrae not 135° 43
250° 150"

" " Winnecke's Comp. 300° 47" .

P α Cygni not 102° 180"
190° 150"

~~P.PS.SU ξ Pegasi~~ C .C
1d 211

PU, PS PS α Aurigae .

P P α Cygni

C

~~Dumbbell~~ B 270 50" wrong comp.? C
C 290 120

κ Pegasi too bright C .

ε Pegasi C C

~~η Cephei~~ . . C .

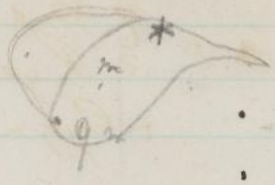
β Aquilae C .

C .

Phot. II .

α Ursae Minoris S. C

Jupiter Transits
Occults.
Spots



. .

α Cygni ? .

ε Cygni .

η Lyrae

C

P, PS,	α Arietis	1	58			107	19°.5
P	α Tauri	4	26		β	107°	30"
P	α Orionis	5	46	+7	1 11	155	160"
	β Can Min.	7	18				
	α Aurigae					183	126
Pu, PS	δ Cancri	8	36	+19		121	46"
P, uSu, P	μ Sagittarii	18	4			260	15
P						115	60
SU	α Lyrae	18	31			250°	150"
					Winnecke	300	47"
					net	135°	43"
uP, PS, PuPS	α Aquilae	19	43			323	153"
P ~~Pu~~ PPu	β Aquilae	19	49			15°	13"
Psu, Pu, Pu	β Capricorni	20	12				
~~P, S, uSP~~	~~β Delphini~~	~~20~~	~~30~~	~~14~~			
					net a 118 105		
P su, uP	α Delphini	20	32	15	b 150 60		
P su, uP	"				c 270 50		
P su, uP	"				d 300 70		
					net:	102	180
P	α Cygni	20	35	43		190	150"
PS, PSu	γ Equulei	21	4	5		10	41"
	η Cephei	20	42	61		R 57.70	
					net: 14a	327	85
P, Pu	ε Pegasi	21	36	9	→	307	50"
P.S uus,	ε Cygni	20	41	+33		321	37
Pu, us	"					260	100
PS,	κ Pegasi	21	39	25	br.		
					north	120	15
P.PS.	ξ "	22	39	11	→ II	32	110
	42 Herculis				too br.		
~~us, Pu,~~	δ Equulei						

Asteroids 1878.

No.						Opp.	Mag.
1	Ceres +	2	+ 13			Nov 1.	7.6
2	Pallas. +	23	~~+10~~ −5	+ 2 50 ~~25~~	−17:0	Sept 8.	8.8
3	Juno +	22	−10	+2m 420	−15:7 ~~17.45~~	Aug 27	8.1
4	Vesta +	7	+20			Dec. 38	6.9
5	Astraea +	3	+10			Nov. 16	9.5
6	Hebe +	3	−10			" "	7.4
15	Eunomia +	7	+28			Dec 36	8.1
~~33~~	~~Polyhymnia (31)~~	~~23~~	~~−7~~			~~Aug 30~~	~~8.9~~
~~40~~	~~Harmonia +~~	~~5~~	~~+19~~			~~Dec. 4~~	~~9.0~~
~~109~~	~~Felicitas (37)~~					~~Nov 11~~	~~8.6~~

Planetary Conjunctions 1879

.	Jan 23	Venus	Jupiter	−47′	1	2	
	Feb. 19	Mars	"	−1°28′	23	39	
.	Mar 2	Saturn	Venus	−1°11′	1	33	
.	" 14	"	Mercury	−2°8′		57	
:	" 31	Neptune	Venus	−1°56′	1	51	
:	May 8	Mars	Jup.	− 52′	19	34	
.	" 24	Nept.	Mer.	+ 27	22	23	
.:	" 30	Mars	Saturn	+ 1′	20	17	+3
.:	July 8	Uranus	Venus	− 15′	3	10	
	" 29	"	Mercury	+3°43′	1	52	
.:	Aug 13	Neptune	Mars	− 15′	17	11	
.	Sept. 14	Uranus	Mercury	− 39′	22	54	
	" 25	Mercury	Venus	+11°11′	23	23	

Japetus

Oct	1		27	
	6		15	
	11	n	0	
	16		15	
	21		27	
	26		36	
	31	~~f~~ p	39.	
Nov	4		36	
	9		27	
	14		15	
	19	s	0	←
	24		15	
	29		26	
Dec	4		34	
	9	p f	37	
	14		34	
	19		26	
	24		14	
	29	n	0	
Jan	2		14	
	7		24	
	12		31	
	17	f	34	
	22		31	
	27		22	
Feb	1			
	6	s		←

Hyperion

			Nature.		
Oct.	4	p	2		pr.
	15	f	13	11	
				16	
	25	p	23	21	pr.
				26	
Nov.	5	f	3	1	fol
				6	
	~~15~~	~~p~~	~~13~~	~~11~~	pr.
	25	f	23	21	
				26	
Dec.				1	

add two days.

Elong	160
1 day	15
2	12
3	10
4	5
5	0

Mimas

		Hall.		
Oct.	1	13.4	W p270° +1.6	
	2	12.0		
	3	10.6		
	4	9.2		
	5	7.9		
	6	6.5		
	7	5.1		
	8	3.7		
	9	13.6	E p 90°	
	10	12.2		
	11	10.8		
	12	9.4		
	13	8.1		
	14	6.7		
	15	5.3		
	16	3.9		
	17	13.9	W. p270°	15.4
	18	12.5		14.0
	19	11.0		12.6
	20	9.7		— 11.2
	21	8.4		9.8
	22	7.0		8.4
	23	5.5		7.0
	24	4.2		5.6
	25			
	26			
	27			
	28	16.2 4.7		11.5
	29			
	30			

Mimas.

Date	G.M.T.		C.M.T.		
Oct. 29	14.9	E f 90	10.2		
30	13.5		8.8		
31	12.1		7.4		
Nov. 1	10.7		6.0		
2	9.3		4.6		
3					
4					
5	16.5	W	11.8		
6	15.1		10.4		
7	13.7		9.0		
8	12.4		7.7		
9	11.0		6.3		
10	9.6		4.9		
~~11~~					
13	16.8 47	E	12.1	10	P.S.u Pen.
14	15.4		10.7	9	u P.P.
15	14.0		9.3		
16	12.6		7.9		
17	11.2		6.5		
18	9.9		5.2		
20			1	12.0	
21	17.0	W	12.3	10.6	
22	15.6		10.9	9.2	
23	14.3		9.6	7.9	P
24	12.9		8.2	6.5	
25	11.5		6.8	5.1	

Stars near Saturn 1878.

1 yr 25 − 79

RA +3ˢ.07 ~~16.7~~ R. = 2.7m.

Dec. −20″.0 18′.0

	1825.0				1879.0			
9	23h 48m	6s	−3°	57′.0	23h 50m	~~48~~ 52	−3°	39′.0
67	52	57	−4°	0.1	55	33	3	42.1
8	53	4	3	44.4	55	46	3	26.4
♄ Oct. 1					59	32	2	50.3
Nov. 1					52	13	3	34.6
Dec. 1					49	40	3	44.7
7	43	56	4	7.6	46	42	3	50.

Jupiter.

I II ps. pu.

~~C III su, ps, p~~

IV p, sp, s

II III s

IV ps

~~C III IV pu, ps s~~

1 2 3 4

7 1 6 3

C β Cygni ps, su, p

C γ Andromedae p, ps, s

~~C I ps pu s~~

~~C II s s p pu~~

~~C III s s p pu~~

~~C IV s ps pu~~

Zones to be observed.

Zone 10' wide and 2 minutes long following :-

α Canis Majoris
α Lyrae
β Orionis
α Aurigae
α Bootis
α Canis Minoris
α Virginis
α Tauri

α Aquilae
α Piscis Australis
α Leonis
α Scorpii
β Geminorum.

Stationary st of Leitner.
Surrounding new stars in Cass.
Oph.
..
Vulpec
Corona
Cygnus

Juno ③

Oct ~~16~~ 15	22	0	48	11	36.9
19		1	43		58.1
25		3	57	12	23.1

B.A.C. $\overset{37}{\underset{38}{e}}$ Aq	22	2	31	−11	33.4	22	4	4,	11° 24.9
		1	33		8.5				
e²		2	36	−12	18.0		4	9,	12° 9.5
	21	59	19	−11	10.6	22	0	52	11 2.1
W. xxi 1398.(9)		59	12	−12	27.9		2	5	−12 12.2
		59	57	−12	13.1		2	50	−11 57.4
38 7.8	22	1	11	−11	40.8		4	4	−11 25.1
6		1	16	−12	25.3		4	9	−12 9.6

Ceres. | Pallas | Juno.

	③	δ	a
Oct 29.	ρ u s ρ s	§ u	
4	s u ρ s u ρ	ρ u ρ u	
5	ρ u ρ u	ρ u ρ u	ρ u ρ u
6	ρ u ρ u ρ u		ρ u ρ u ρ u

W. Eq.

Nov. 5. ρ u, ρ u
6 ρ s u, ρ s u

3.2141
29
28876
6428
93.156

17.48
3
5244
175
6|507
− 8.5

3.244
54
128
160
1728
253

175
54
700
875
94.5
15.7

Pallas ②

λ Aquarii	22	46	19	−8	~~17.7~~ 13.0
② Oct 21	22	43	58	8	41.9
	22	43	16	−9	17.5

Mimas	E	W	Hyperion	E	W	Neptune Satellite	E	W
Sept. 25	PU.		Sept 7		P,S	Sept 23.	PU	
Oct. 14	U		30		P,S	Oct 16	P	
" 21		UP	Oct 1			26		PS
			21		U.P.S	28	PSU	
			22		U	29	PU	
			28	P				
			29	P				
			1	P.U.S		Nov. 6		PS U
			2	P				

⊙ Ceres. 1878

At Transit at Greenwich

Month Day	Apparent Right Ascension			Apparent Declination		
	h.	m.	s.	North.		
				°	'	"
Oct. 31	2	27	38.	2	34	26.
Nov. 2	2	26	8.	2	30	58.
" 4	2	24	19.	2	27	57.
" 6	2	22	31.	2	25	25.
" 8	2	20	44.	2	23	22.
" 10	2	18	59.	2	21	52.
" 12	2	17	16.	2	20	54.
" 14	2	15	35.	2	20	29.
" 16	2	13	58.	2	20	39.
" 18	2	12	24.	2	21	24.
" 20	2	10	54.	2	22	44.
" 22	2	9	28.	2	24	41.
" 24	2	8	6.	2	27	14.
" 26	2	6	47.	2	30	24.
" 28	2	5	38.	2	34	10.
" 30	2	4	31.	2	38	33.
Dec. 2	2	3	29.	2	43	31.
" 4	2	2	34.	2	49	5.
" 6	2	1	44.	2	55	13.
" 8	2	0	59.	3	1	56.
" 10	2	0	21.	3	9	11.
" 12	1	59	48.	3	16	59
" 14	1	59	21.	3	25	19.

		h.	m.	s.	°	′	″
Dec. 16		1	59	1.	3	34	9.
" 18		1	58	46.	3	43	29.
" 20		1	58	37.	3	53	18.
" 22		1	58	34.	4	3	35.
" 24		1	58	37.	4	14	20.
" 26		1	58	45.	4	26	30.
" 28		1	58	60.	4	37	5.
" 30		1	59	20.	4	49	5.
" 32		1	59	46.	5	1	27.
α Ceti		2	55	59	3	37	0 57
γ "		2	37	3	2	43	60
88		2	18	12	2	22.6	~~22.6~~
α	2.5		54	24	2	37.1	~~+8~~
γ	3.5	2	35	49	2	38.2	~~38.2~~
7.84		2	4	13	2	46.9	
~~58~~		+	1	35		+.5	
88		2	16	37		17.6	

② Pallas, 1878.

At Transit at Greenwich

Month Day		Apparent Right Ascension North.			Apparent Declination South.		
		h.	m.	s.	°	′	″
Oct.	30	22	42	54.	9	57	30.
Nov.	1	22	42	55.	10	12	2.
"	3	22	43	1.	10	25	46.
"	5	22	43	12.	10	38	41.
"	7	22	43	28.	10	50	47.
"	9	22	43	49.	11	2	6.
"	11	22	44	16.	11	12	38.
"	13	22	44	47.	11	22	24.
"	15	22	45	24.	11	31	23.
"	17	22	46	5.	11	39	38.
"	19	22	46	51.	11	47	9.
"	21	22	47	41.	11	53	56.
"	23	22	48	37.	12	0	1.
"	25	22	49	36.	12	5	23.
"	27	22	50	41.	12	10	5.
"	29	22	51	49.	12	14	8.
Dec.	1	22	53	2.	12	17	32.
"	3	22	54	19.	12	20	18.

③ Juno, 1878.

At Transit at Greenwich.

Month Day	Apparent Right Ascension			Apparent Declination. North.		
Oct. 30	h.	m.	s.			
Nov. 1	22	6	37.	12	37	50.
3		7	52.		42	11.
5		9	14.		45	40.
7		10	42.		48	17.
9		12	16		50	5.
11		13	56.		51	3.
13		15	42.		51	12.
15		17	33.		50	34.
17		19	30		49	9.
19		21	32.		46	58.
21		23	39.		44	2.
23		25	51.		40	21.
25		28	7.		35	56.
27		30	28.		30	48.
29		32	54.		24	58.
		35	25.		18	27.

Dec. 3.	22	40	37	−12°	3′.3
7	22	45.8		11	47
17	23	0.5		10	53
27	23	16.4		9	45
87	23	33.4		8	26

1850

e^1	22	2	31	11	33
e^2		2	36	12	18
7740		4	17	11	48
40		5	25	12	39
42		8	46	13	35
45		10	58	14	3

Stars near Juno Dec. 3, 1878

λ Aquarii	22^h	46^m	18^s	-8°	$13'.4$
WB 814 (9)		39	45	−12	11
816 (8)		39	52	11	48
840 (8.9)		41	22	13	9

November.

1 ☽ 1st Qr.

2 8h 19m Jup I ~~7 48~~ 2 54 Algol Jup (2 3)?

S 3

4 2 49 Jup I

5 Jup, 34, 12.

6 10h Neptune Sat. Jup 34, 12.

7 6 45 Jup. IV Dis

8 ~~☽ 1st Q~~ Jup 34. H.C.Com.

3 50 Jup II

9 Full 0 13 Jup I. 5 27 S Cancri

S 10

11 4 44 Jup I

12 7h Neptune's Sat. R.Com? 10 a.m.

13 14 9 Algol A.M.C., A.A.S.

14 Juppiter 23.

15 9:27

16 6 28 Jup II 10 58 Algol.

S 17 ~~☾ total~~

18 ~~☾ Rises 9h 7~~ ~~tele Nept Sat~~ 6 37 Jup I 17 3 S Cancri II, III

19 7 47 Algol.

20 Minima 120 Hyp

21 II, III Com. Meet.

22 4 36 Algol. II, IV

23 9 3 Jup II ~~Lat~~

S 24 5 36 " IV II IV, ~~II IV?~~ II IV?

25 8 34 Jup I. 1 25 Algol ~~II~~ IV.

26

27

28 Thanksgiving, 4 45 Jup III II 8. 17, 4 40 S Cancri II III

29

30

~~Mimas. W, u P, P, PS, P~~
Iapetus
~~Hyperion. E, P uS, P, PS, SP P~~

Neptune PS, PSu.
Juno. ③ Pu, PSu.

Jupiter ~~I, IV PS, PS, P~~
II III S
~~II IV. PS, uS, P~~

Pole Stars. Phot-K. α, α — 2.0 – 8.8 P, PS,
" 51, 51 — 5.0 – 9.5
" I 15", α — 10.0 – 15
J — 12.0 – 15
I 5" 8.0 – 12
J. 10.0 – 12

Phot. I.

Phot. M

β Persei
S Cancri.

Standard Polars. Unfin Jan 27

	DM.	Des	R.A.		Dec.		Mg.	K	I 5 in
a	88°.8	a					2.0		
δ	86 269	δ					4.5	~~u s~~ S	
51	87 51	51					5.0	~~u s~~ S	
λ	88 57	λ					6.5	~~u s~~ S	
4	88 4		0	49	88	22	7.5	~~u s~~	
9	88 9		1	59		37	8.0	~~u s~~	~~psu~~
3	89 3		2	25	89	38	8.8		~~psu~~
5	" 35		17	56		48	9.3		~~pssu~~ S
a 7	" 37		19	38		54	9.3		~~psu~~
1	" 1		0	23		44	9.5		~~pssu~~ S
6	" 26		12	58		49	9.5		~~pssu~~ S
b									~~psu~~

Unfin Jan 27.

		y	x	I	J	Finished			Wanted I		
13	h	15.	39	~~p~~	—	br.	—	11	~~p~~	S~~S~~	~~u~~
13	i	19	33	—	~~pS~~S	p	pSS	12	~~p~~	~~S~~S	~~u~~
14	j	22	30	—	~~pS~~S	p	pSS	13	~~p~~	S~~S~~	~~u~~
15½	g	28	33			ppp	....	14	ppp	SSS	uu
11	a	28	42	~~p~~ —	—	br.	—	9	~~p~~	~~SS~~	u
12	b	29	40	—	~~SSuu~~	p	....	11	–	S	–
14½	f	32	27	~~Su~~	~~S~~	–	S	14	~~p~~	~~S~~S	u
13½	c	33	34	~~pSu~~	—	–	— ~~c~~	13	~~p~~	~~p~~SS	u
14½	e	37	27	S~~Su~~	—	–	~~S~~	14	~~p~~	SS~~1~~	u
13	d	38	32	~~SS~~	—	–	~~S~~	13	~~p~~	S~~S1~~	~~u~~

	I
10	4.00
11	2.50
12	1.60
13	1.00
14	.63
15	.40
16	.25
17	.16

Wanted Feb 2d.

I	J	I 5" ap.
e by S	i, j by S	89°35, 89°1, 89°26 by S

5''
I
Dec 31

Dec 31
K a K.51
Nov 24 Nov 6, 26. Dec 6

pp PuPu Pu PS
uss p Pu Pu PS
uss p Pu Pu PS S.u.P.
uss p Pu Pu PS
Puss 2 6.1 Pu Pu PS PS
Puss 3 8.2 Pu Pu PS PS Pu PS Psu
4 8.7 Pu PS Psu
6 PSu Pu PS ~~Psu~~
7 9.2 PSu Pu PS PSu
1 9.2 Pu PS Pu
5 Pu PS Pu

Phot I Phot I
Dec 16 18 20 22 Dec 17, 19, 20 22
PSu p Pu Su Tr.
C PSu ~~Pu~~ p Pu Pus Pu p Pu ~~PS~~
C PSu p Pu Su Pu p Pu
Pu Pu
Tr. PSu p Pu PS

Comp. C PSu PuP Pu P Pu p ~~Pu~~ Pu. PS. PSu
PSu p Pu PS Pu p Pu
PuP Pu PSP Pu p Pu C
PuP Pu PS Pu p Pu C
PuP Pu uP PS Pu p Pu C

Double Stars.

							″	°
56 Aurigae	6	37.7	43°	42′	5.3	9.0	1.40	
γ Leonis	9	29	14	56	4.0	9.5	3.270	272°
ι Bootis	14	12	51	57	4.9	7.5	38	33
ν Draconis	17	30	55	16	4.6	4.6	62	313
β Lyrae	18	45	33	13	3.0	6.7	46	150
3 ε Draconis	19	49	69	57	4.0	7.6	2.8	355
4 κ Cephei	20	13	77	20	4.0	8.0	7.4	
6 β Cephei	21	27	70	1	3.0	8.0	14	250
8	22	10	72	41	5.5	7.6	29	349
2	23	4	74	43	5	7.	1	

α Ursae Min.
α Lyrae
β Orionis
α Can. Maj.
ζ Ursae Maj.
39 Drac.

December, 1878.

S 1 D Jupiter II, III O 3· 4· 1· ·2

2 " " " ?

3

4 Jupiter I 4h 58. comp II

5 Jup Sat Th. Cl. Mus Me

6 Algol 12 41

7 S Cancri 16 17

S 8 Jupiter II. III

9 O Algol 9 30

10 5h3 Jupiter II III

1 6 9 Jupiter I 6 53 comp II. IV A.M.C. " G.A.S.

2 7 19 Algol 6 39 C. Cl.

3 8 30 Jupiter I 1h 22m Leading Club

4 9 41

S 5 10 53 Algol 3 8 II, III

6 ☾

7 S Cancri 3 53 II III

8 Jupiter II. 6 20 comp IV

9 Th. Cl.

20 Jupiter I 3 16 I

1

S 2 II III

3

4 II III

5 Christmas

6 Algol. 14 24 S Cancri 15.30 C. Cl.

7 Jupiter, I, 5 1 comp III

8

S 9 Algol 11 13 II III

30 II "

1 " "

(Date.)

( ) (Star) ( ) obs.

f = focus for bright star   f = focus for companion

Zero of Position

( ) A.P = 97°; 7°0. M = 97.°

E = 75°.0 t' = —

—

85°0 t'' = —

—

( ) Angle of Position

R.D = —, — A.P = —, —

— —

= — —

— —

( ) Distance

A.P = — , — R.D = — —

— —

= — , — —

( ) — —

$(t' - t'')$	Z.a	Dist a
$(t' + t'')$	Z B	" B
$(300(t' - t''))$	a + B	a + B
$\left(\frac{300((t' - t''))}{t' + t''}\right)$	$\frac{a+B}{2}$	a − B
Zero		$\frac{a-B}{2}$
		$.4\,\frac{a-B}{2}$

Phot. J.

		Japetus	11 mag
1	Dec 13.	Su.	Su
2	14.	PS.	PS
3	16	PSu	PSu
4	17	Pu	Pu
5	18	Pu	Pu
6	19	Pu	Pu
7	20	P	P
8	23	Pu	Pu
9	24	Pu	Pu
10	25	Pu	Pu
11	26	Pu	Pu
		P = 10. S = 3, u = 8.	P = 10, u = 8, S = 3
	30	u	u

R H^3, 151. Star seen 5′ south of 7 Cam.
Double, mags. 5 & 6.
7 Cam. α $4^h\ 47^m$ δ +53° 32′.

1878phae.proj..471O

1878phae.pr